The Builder.

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Earthquakes and Building Construction.

AVERY useful work, showing the present condition of our knowledge concerning earthquakes, has recently been written by Professor John Milne.* The greater part deals with the purely scientific aspect of seismology, with which we have little concern; but there are two long chapters devoted to buildings and building materials in earthquake countries, which form the most valuable contribution to that aspect of building construction that has been made in recent years. Professor Milne's long residence in Japan has made him specially familiar with the subject, and whilst many of the problems are approached from the Japanese standpoint, the author is able to draw largely from observations made in other countries. Nobody will quarrel with the author for his very frequent citation of results obtained in the Far East, however, for it is a healthy sign of the times that the modern scientist is more contented to draw upon circumstances arising within his own knowledge, than to quote distorted accounts made by untrained and inaccurate observers. There is still a general lack, in scientific works, of the careful recording of the truth. So many authors do not possess the peculiar faculty of sifting the painstaking and laborious result, from the slipshod information of the mere reporter; further, many of them appear to be unable to discriminate between fact and theory, the proved truth and the avowed hypothesis. But, the reader will not find any shortcomings of that nature in this book by Professor Milne.

Passing by the chapters treating of slow movements of the earth's crust, we arrive at the causes of earthquakes—a difficult subject to satisfactorily explain. To briefly summarise the author's views, it may be said that wherever bending is taking place in the earth's crust we find earthquakes; whilst if this process is going on in the vicinity of an ocean we find both earthquakes and volcanoes. Although a volcanic explosion, or an abortive attempt to establish a volcanic orifice, has often caused the ground to shake, the greater number of disturbances are either due to rock fracturing, or to equilibrium adjustments of a subterranean quasi-rigid magma. The sudden eruption of a volcano may occasion a local shaking, or cause an area in seismic strain to yield. In this case, the volcano is the parent of the earthquake. On the other hand, by the sudden shaking of the ground a vent which has been dormant for a long period of years may have its statical equilibrium destroyed; and then the relationship is reversed.

The next chapters give a general description of instruments used for recording movements of the earth's crust, the nature of earthquake motion, the velocity of earth waves, and a consideration of seismic elements which are calculable. One of the most interesting records of earthquake motion is that made by Professor Milne at Carisbrooke Castle, on August 26, 1896. The point of origin of that disturbance was in north-eastern Japan, as subsequent information showed, and the movement recorded in the Isle of Wight travelled direct from that point to England through the globe. The culmination of the movement, in this case, was preceded by preliminary tremors which lasted over thirty-four minutes. There appears to be a relationship between the distance of an origin and the interval of time by which tremors outrace the more decided motion.

Turning to the section which more immediately interests us, we find that the author commences with the "choice of a site" for building upon. It has been shown by the Seismological Survey of Japan, that whilst a great portion of the country is subject to violent earthquakes, there are certain localities as free from those disturbances as are many parts of England. The practical point, however, is to select a site of comparative immunity from earth movements within the narrow limits of a city. For the problem most frequently presented, gives very little freedom of choice over a wide area, for obvious reasons. In many instances it has been proved that high, hard ground suffers very much less disturbance than the soft, low ground, so that a city built over a site covering these two forms of ground may be divided into two parts, one of which is comparatively much safer than the other. This phenomenon was so well exemplified by the earthquake in Ischia in 1883, that the Italian Government took advantage of the observations then made to mark out sites on which the new town might be built. "Carefully made seismic surveys have distinctly shown that on a plot of ground, not more than ten acres in extent, the quantity of motion experienced on one side of such a tract might be sufficient to shatter a building, while a similar building not more than 900 ft. distant on the other side might remain undamaged." It would have been interesting had the author said something concerning the geological structure of any particular plot of ground which exhibited these phenomena. Instead of that, we are left to infer that the difference was in some way connected with a marsh—"the dangerous side of one plot of ground . . . bordered a marsh, and was consequently somewhat wet and soft."

The author gives a bad character to steeply sloping ground, which is deprecated as a site for construction of any description. Similarly, buildings in countries subjected to earthquakes should never be erected along the upper edges of cliffs, escarpments, and deep natural, or artificial cuttings. On river banks, fissures running parallel with the direction of the river are apt to be formed at distances of from ten to fifty yards from the river front, and within that zone buildings are likely to be demolished. At the same time, if in any particular locality it can be shown that earthquake movement comes from a definite direction, it will often be possible to demonstrate that the bank on one side of the river only becomes affected, the other side being comparatively free.

It is well known that for many years regulations have been laid down in certain districts concerning foundations, the type of superstructure, and the best materials to be employed to successfully withstand earthquake shocks. Professor Milne reviews these regulations at some length. In regard to foundations, the Ischian regulations provide that buildings must be founded on the most solid ground; if, however, the ground is soft, this may to some extent be remedied by the construction of a platform of masonry or cement, which, for a one-story building, must be 70 mètre thick, and for a two-story building 1·20 mètres thick. This platform must

* "Seismology." By John Milne, F.R.S., F.G.S. London: Kegan Paul, Trench, Trübner, & Co., Limited. 1898.

extend from 1 mètre to 1·50 mètres beyond the base of the building. These, and similar rules, enforce the fact that a building which stands upon a continuous foundation, sufficiently well bound together to move as a whole, suffers less racking than if it rose from a base the different parts of which might be simultaneously moved in several directions. A building rising freely from a deep foundation, as in the case of a house with an open area or basement, will be subjected to less movement than a building rising directly from the surface. The author gives instances proving this. "The most remarkable illustration of this description occurred in 1891, when Tokyo was rocked to and fro by a series of large undulations which originated at a point about 200 miles distant. On this occasion, the Engineering College at the University received not a single crack, whilst its workshop, some twenty yards distant, was so far damaged that it had to be re-roofed and its height reduced."

In cellars, vaulting may be allowed, but not above ground; above ground, arched construction in any form is invariably suppressed by official regulations. A peculiar method of constructing foundations is worthy of mention. The author had a bedroom attached to his house in Japan which rested at each of its pillar-like foundations on large iron shells carried in dish-like castings, the idea being to give a free foundation to the structure in order to minimise the quantity of motion received during a shock. He had not reckoned with high winds, however, so the building was found to be too unstable, and rolled from side to side. Ultimately ¼-in. cast-iron shot, placed between two flat iron plates, was employed, and found to be better; for the increased friction was sufficient to resist the effect of winds, whilst it was insufficient to overcome the inertia of the building, which, therefore, tended to remain at rest whilst the ground beneath, during earthquakes, rapidly moved to and fro. It is suggested that short rollers placed at right angles, or a layer of rounded pebbles, might be equally effective. The author seems somewhat afraid of his suggestions, however, as he does not recommend them except as illustrations of a principle having many practical applications. This sort of foundation may be successfully employed for light structures on soft ground, but not for heavy buildings. Yet we are told that a heavy building erected in the grounds of the General Hospital at Yokohama, and resting on balls several inches in diameter, has done well. The reasons for this are that the balls rest in deep cup-shaped depressions, and that the building, for its size, is exceedingly heavy.

Passing to the consideration of roofs, it will be readily perceived that these must not be heavy, or they will not sway at the same moment as the more lightly-constructed walls, and collapse of the whole would be inevitable. Light roofs, built so that they rest freely upon supporting walls, have proved successful. In Japan, temples and other large buildings with heavy roofs have, beneath the supporting timbers, a multiplicity of timber joints forming corbel work, which yields, and does not communicate the whole of the motion from the parts below to those above. At the same time, during the terrible earthquake of 1891, many of these roofs, which had stood for centuries, came to grief.

The roof must not be steeply pitched, as it is liable to have the tiles, slates, or other covering thrown off. Tiles should be especially well secured near the eaves and along the ridges. Roofs made of sheet metal are, no doubt, successful as withstanding earthquake shocks, but they have to be very strongly secured to be proof against cyclones and typhoons, and are an intolerable nuisance in hot weather—at least in tropical countries.

Walls should be light and strong, and, for buildings, ought not to be carried higher than from 25 ft. to 30 ft. above the level of the ground. In certain districts, as Liguria, a height of 50 ft. may be permitted, but one would hardly call that a severely-stricken earthquake country. Professor Milne states that the length of a wall should not exceed twice its height unless supported by a buttress; whilst buttresses might be placed at intervals not greater than twice the height of a wall. Its thickness must be one-fifth of its height. The corners of buildings should be strengthened by buttresses. In houses of two stories, the lower story may be built of stone or brick, whilst the upper may be of wood, resting on, but not built into, the supporting wall. The last house at either end of a terrace, and especially the end walls, must be very strongly constructed, and the same observation applies in the erection of a long, low building. The best methods of constructing piers for bridges, and chimneys, are set out in much detail. The principal point about chimneys is that they should be low, and not top-weighted.

The connexions between different portions of a building are next considered. The chief factor is that the materials employed in construction should be of uniform character (with the few exceptions already noticed) so that on receiving the shock they shall vibrate in unison. It is obvious that if a wall is a compound, say, of stone and wood, or brick and wood, there will be a corresponding want of homogeneity, which will lead to disaster. But, the building may be strengthened beneficially in many ways. In San Francisco, for instance, the City Hall is fortified by the walls at each floor being tied together by transverse and fore-and-aft rods of steel and iron. It may be doubted, however, whether this method of rigid construction is better than the opposite extreme, which allows free play, so that each part of the structure may be capable of yielding in the same manner as with a wicker basket. Ornament should not project from the face of the building, which ought to be kept as compact as possible.

Archwork is reviewed at length, and the author agrees with the generally accepted opinion that, whilst an ordinary arch is undoubtedly stable for vertically applied forces, it is one of the most unstable structures in presence of such horizontal stresses as are set up in earthquake motion. There are many useful notes concerning openings in walls (such as doors and windows), balconies, cornices, gables, ceilings, and staircases, and on the construction of reservoirs. This portion of the work concludes with some account of the destruction caused by sea-waves during violent shocks.

The remainder of the book, of less direct interest for us, deals with certain miscellaneous seismic phenomena, undulations, pulsations, and earth tremors; but the final chapter is an excellent epitome of "movements of the earth's crust in relation to physical research and engineering." In the last-mentioned chapter, the few observations on vibrations of bridges, buildings, &c., are interesting, though not particularly novel.

NOTES.

The Plasterers' Dispute.

A LOCK-OUT on Monday of the members of the Plasterers' Unions now appears to be inevitable. The operatives have, by ballot, it is stated, almost unanimously decided to resist the demands of the Master Builders' Association that certain objectionable practices, described in our last issue, should be discontinued, and unless a conference can be arranged between the parties at the eleventh hour, the lock-out will commence on Monday. While the result is to be deplored, it is not at all surprising. Given men, on the one hand, who appear to think that they alone are the factor to be considered in industrial enterprise; and employers, on the other, who insist on the right of managing their own businesses, no other result is possible, though we think that a conference of employers and operatives held with the honest endeavour to avoid either a lock-out or a strike, could not have failed to remove some of the friction and might have resulted in a settlement of the dispute. No one who understands the points at issue can be surprised that the employers have submitted what is practically an ultimatum, and it seems amazing that the rank and file of the operatives should think, as they appear to do judging from the result of the ballot, that employers have little more to do than to find capital and take all risks. In the present temper of both parties the dispute is not likely to be soon ended.

The "Employers' Parliamentary Council."

WE have received a circular from "The Employers' Parliamentary Council," which appears to be an institution for the purpose of opposing legislation which may prove injurious to the interests of employers. While we quite agree with the opinion expressed in one paragraph in regard to the exaggerated tendency among a certain class of politicians to nurse the working man, and the evident readiness of the workingman to be nursed, we think the Employers' Parliamentary Council will defeat whatever is reasonable in regard to some of their objects by their unreasonable attitude in regard to others. Their paper gives a list of Bills to be brought forward shortly, with the "objections." A Bill to empower the Secretary of State to prevent any one having charge of a steam-engine or boiler of more than five horse-power unless such person has obtained a certificate from him by examination, or on application on proof of practical experience, is denounced as "creating a monopoly in the labour market." A Bill for providing for inspection (not less than five times a year) of every steam boiler in use in the United Kingdom, is "an undue interference by the State with trade concerns." No doubt it would compel employers, whether they like it or not, to keep their boilers in proper condition instead of running the risk of blowing up their employees; but we should call it a most wholesome regulation in the public interests. Some of the other Bills mentioned are open to objection, but the general tendency of the document is to urge that

employers are never to be interfered with at all; and we have got long past that point.

The Cottage Homes Bill.

THE Bill to enable Local Authorities to provide Cottage Homes for the aged and deserving poor has passed its second reading in the House of Commons, and has been referred to a Select Committee. It is more than doubtful if it will advance further through Parliament this Session. Of course, it is almost an impossibility for a Local Authority to decide who is, or is not, a deserving person, for every detail of a lifetime must be known for this purpose. Almshouses were at one time common in rural villages, but they have gradually disappeared. They often formed a picturesque architectural feature of a country village, but the workhouse practically put an end to them. From a practical point of view, we should doubt whether a respectable working man of sixty-five, unable to support himself, would be much better off in a cottage workhouse in a village than in a large building in a semi-central position, as at present. On the other hand, cottages in many districts are unquestionably in bad condition and insufficient in number, and we are inclined to think that if each Parish Council had a few cottages in which persons over sixty-five, of good character, who had some small means, but not enough to pay for a cottage (even if they could find one), could live rent-free for the rest of their days, it would not be undesirable.

Artesian Wells for London.

THE London County Council is to be assisted in its efforts to supply the Metropolis with water by Mr. R. P. Whellock, architect, surveyor, and geologist; at least, so we learn from a daily paper. This gentleman has discovered that "underneath the blue clay of London there is a vast supply of water." This will probably be news to the County Council, in view of their Welsh scheme, which had better be abandoned. A well in Houndsditch is to act as a sort of centre, after the manner of Charing Cross, only, instead of cab-fares, "artesian" wells are to be regulated at distances. That there is actually a great supply of water under this clay has only been discovered after a study of six years, according to our contemporary, by the architect, surveyor, and geologist quoted. As a "geologist" he might have known that for at least the last fifty years the great underground supply of water has been utilised in London by very many important institutions, hospitals, breweries, &c., and has always been regarded as a readily available source of supply in case of need. The suggestion to supply limited areas with drinking water from the chalk under London is by no means novel, but when we learn from the scheme now propounded that it is to be "effected at a comparatively small cost," whilst further on we read that "an acre of ground" will suffice for each of the numerous stations proposed, we have our misgivings from the financial standpoint. The London County Council, however, does not stick at such trifles as this, and no doubt it could find the money. Mr. R. P. Whellock will find that the chief opposition to his views in that quarter will be that the water companies are not to be affected. His scheme does not propose to "supersede the water companies," so "he cannot conceive that they would offer any opposition." We should strongly advise him to wait until the London Bill for creating a number of municipalities in the Metropolis is enacted before breathing this ancient idea to the electors, because a piecemeal water-supply scheme could be better dealt with by each municipality concerned than by a central authority.

Hampstead Heath Protection Society.

THE Second Annual Report of the Hampstead Heath Protection Society shows that the Society are doing good work in guarding against any proceedings tending to spoil the Heath, and have been successful in getting some of their recommendations carried out. The complaint about the deposit of rubbish on the Heath has been satisfactorily met by the London County Council, who stated, in a letter of April 20, 1898, that the clay had been placed there without the authority of the Council, and that it and other material had been removed, and would not in future be used for filling up rain tracts on the Heath. They have succeeded in inducing the County Council to purchase the Golders Hill Estate, though, since the estate was opened provisionally on December 1, 1898, they regret to have received complaints of wilful damage to the plants, but efforts are being made by the Trustees of the Hampstead Heath Extension Scheme to secure more adequate supervision on Sundays and other holidays. The thinning of the young fir trees planted by the Metropolitan Board of Works on the Western Heath has been carried out by the London County Council, and will have the effect of preserving and strengthening the trees that remain. The Committee express a strong opinion that the margins of the ponds which have been made bare by the Council should be restored as far as possible to their natural condition, in order that the water and waterside plants (which have afforded protection to wild birds and water fowl) may be developed.

A Road-making Exhibition.

IT is announced that in the next Building Trades Exhibition, to open at the Agricultural Hall on April 26, a special feature will be a collection of exhibits of materials and plant connected with road and street construction, maintenance, and cleansing. This is intended as an experiment in illustrating the class of work with which municipal engineers and surveyors have to deal; and if it is successful, it is intended in future exhibitions to have special exhibits illustrating work connected with sewerage, water supply, lighting well, &c. This is an excellent idea, and if carried out will add much to the interest of these exhibitions.

Menai Suspension Bridge.

IT is stated that this structure is to be sold for 15,000*l.* to the Local Authorities of Anglesey and Carnarvon. In 1801 Rennie was instructed by the Government to survey the Straits, and prepared four different designs, including a bridge of one arch, and another bridge of three arches; nine years later Telford made a further survey, and in May, 1818, sent in his second report, with estimates for a suspension bridge from Ynys-y-moch (Pig's Island) Rock. On August 10, 1819, the first stone was laid by W. A. Provis, the resident engineer, who published (1828) a large folio volume containing a technical and historical account of the works, with surveys, drawings, plans, and views. The stone for the arches and the two piers was quarried from the grey limestone marble beds at Penmon Point, Anglesey, and Shropshire iron, about 2,200 tons, was bought at 6d. per ton. Storms, combined with the normal difficulties of the Straits navigation, hindered the progress of the works, and the expenses amounted to 120,000*l.* In the early morning of January 30, 1826, the bridge was opened to the London and Holyhead mail-coach. Telford's designs were followed for the similar bridges at Pesth (666 ft. span), Fribourg (870 ft.), Hammersmith (422 ft., Tierney Clark, who brought the chains to below the roadway), and Hungerford Market* (676 ft. 6 in., I. K. Brunel). At Menai Straits the horizontal distance between the centres of the main pillars is 580 ft., the pillars (33 ft. wide at top and 66 ft. wide at low water mark) measure 173 ft. between low water and the main chain saddles, giving the underside of the roadway above high water (spring tides) at the piers a height of 100 ft., which increases by a slight camber to nearly 103 ft. at the middle point. The road, laid over deal planks, has two carriage-ways, 12 ft. wide, with a footpath, 4ft. wide, between them. The chains which support the suspension rods, are sixteen in number; they have a total length of 1,715 ft., being carried 60 ft. into the rock; the length of the catenary is about 580 ft. with a descent of 47 ft. The chain-bars are 9 ft. 6 in. long, 3 in. broad, and 1 in. thick; they were tested to a strain of 11 tons per square inch, the weight of the suspended bridge is about 480 tons, and the chains were calculated to support 2,020 tons. Wrought-iron rollers rest upon the apex of each pier; adjusting links are provided, and lateral iron ties are inserted into the piers above the carriage-way arches which rise to 15 ft. with a span of 9 ft.

St. Philip's, Stepney, and London Hospital.

DR. TRISTRAM, Q.C., Chancellor of the Diocese of London, has agreed to issue a faculty from the Consistory Court whereby a plot of unconsecrated land in New-street, on the south side of Whitechapel-road, will be conveyed for the purposes of the proposed extension of the hospital, to be carried out after Mr. Rowland Plumbe's plans and designs. For the parcel of land — 7,500 ft. superficial — the Hospital Governors offered 4,166*l.*, being thirty-three and one-third years' purchase of its annual value. The ground, together with the site of St. Philip's, Stepney, was conveyed to the Church Building (now the Ecclesiastical) Commissioners, and, with their concurrence, the vicar and churchwardens sought for authority to alienate the land under the provisions of the Church Building Acts of 1822 and 1839. The Act of 1845 vests the freehold of a church's site in the incumbent, and in the case of "Plumstead Board of Works *v.* the Ecclesiastical Commissioners" it has been decided that the freehold passes with the act of consecration, the Commissioners having then no power to convey it. The church (1818) was reconstructed by the present vicar, after the designs, we understand, of Mr. Hayward, a few years ago, and forms the chapel of the

* Opened 1845: since removed to Clifton, Bristol. New Hammersmith Suspension Bridge, by Sir Joseph, and Edward, Bazalgette, was opened in 1887.

hospital, with which it is connected by two covered ways.

A Competition in Street Decoration.

THE Union Centrale des Arts Decoratifs has opened a competition for the best scheme for day and night decorations of a public place in Paris, to be kept up during the Exhibition of 1900. The place selected is the portion of the Rue Royale comprised between the Faubourg St. Honoré and the Madeleine. This effort may perhaps have some effect on the decorative style of the special fêtes to be held during the Exhibition, which otherwise it is to be feared would only be a repetition of the ordinary commonplaces of the official fêtes of Paris.

THE REPORT ON WATER GAS.

THE report of the Departmental Committee appointed in February, 1898, to make inquiries concerning the manufacture and use of water gas has been published, and will probably have an important influence in many localities upon the composition of the public gas supply.

Pure water gas, which is made by passing steam through heated coke or anthracite, has no smell and burns with a non-luminous flame. It is therefore "carburetted" or "enriched" by incorporating with it a certain quantity of vaporised oil, or gas produced by the decomposition of oil by heat. The carburetted water gas thus produced possesses a penetrating odour and burns with a luminous flame, the light intensity of the flame depending upon the proportion of oil added.

Now in the greater part of London and in many of our large towns it has been found convenient and economical to add to the coal gas supplied to the public a certain proportion of carburetted water gas, in many districts sufficient carburetted water gas of 22 candle power being added to enrich coal gas of 14 candle power to a standard 16 candle power. The rising price of coal and the difficulty of profitably selling the residual coke are, however, causing carburetted water gas to be largely employed in some places instead of coal gas, as much as 50 per cent. being, it is said, commonly mixed with the coal gas supply of Tottenham and Edmonton.

The chief objection which has been raised regarding the use of carburetted water gas, is that it contains a large proportion of carbonic oxide, a gas which ranks among the most dangerous gaseous poisons. Pure coal gas itself contains from 4 to 12 per cent. of this carbonic oxide, but carburetted water gas contains about 30 per cent., and a mixture of 50 per cent. carburetted water gas with coal gas usually contains about 20 per cent.

Want of space prevents our discussing the merits and demerits of carburetted water gas, but it may be mentioned that about 70 per cent. of all the illuminating gas supplied in the United States is carburetted water gas.

The most important recommendation of the Committee is the limitation of the amount of carbonic oxide at night to 12 per cent., or "such greater amount as the Department may consider desirable."

The Committee propose that the following recommendations should be carried into effect by means of a Public Bill :—

"1. That it should be illegal for any person to make and distribute for heating and lighting purposes any poisonous gas which does not possess a distinct and pungent smell.

2. That all persons applying for statutory powers to make and distribute gas should be required to state in their application the kind of gas which they propose to sell, viz., whether ordinary coal gas, carburetted water-gas, plain water-gas, or other variety of gas, separately or mixed.

3. That before any kind of water-gas is distributed in any place, due public notice of the proposal should be required to be given ; and that, as long as there is any water-gas in a gas supply, that fact should be stated on every demand note.

4. That where water-gas is distributed records should be kept by the producer showing the respective amounts of the gases issued day by day, distinguishing the gas supplied to each area (if more than one and separately served) and the day and night supply ; that these records should at all times be open to inspection by any gas-consumer or ratepayer of the district, and should be published quarterly in a local newspaper, and that a new column should be added to the annual returns made to the Board of Trade giving the total amount of water-gas issued as compared with coal-gas.

5. That power should be conferred upon a central Department to make regulations, enforceable by adequate penalties, limiting the proportion of carbonic oxide in the public gas supply at night to 12 per cent. or such greater amount as the Department may consider desirable. These regulations might be applicable either generally over the United Kingdom or to any particular locality, and might contain such conditions, if any, as appeared necessary.

6. That powers should also be given for the regulation of the distribution and use of gas by means of by-laws, made subject to the approval of a central Department, and administered under local control. The matters to be so dealt with might include the following ;—The hours during which, or the arrangements by which, the limit imposed upon carbonic oxide should be enforced ; the use in emergencies of more than the authorised proportion of carbonic oxide ; the character of the gas-burners, fittings, and apparatus to be used, having regard to the circumstances of their employment ; the testing of gas ; and other similar questions.

7. That the provisions of Sections 28 to 34 of the Gasworks Clauses Act, 1871, should be made applicable to the testing of gas for carbonic oxide, and that in all cases where a limit has been placed upon the carbonic oxide in the gas supply of a locality there should be some person empowered and required to test for carbonic oxide and to publish the results periodically.

Lastly, we are so much impressed by the insufficiency and untrustworthiness of the statistics relating to particular causes of mortality which can be gathered from returns of coroners' verdicts, that we venture, though the matter is outside the terms of the reference to us, to recommend strongly that some steps should be taken to secure that these verdicts should lend themselves more readily to clear classification by the Registrar-General ; and, in particular, we suggest that in every case where the coroner is in possession of a medical certificate of death, or where medical evidence has been taken at the inquest, a copy of that certificate or an abstract of that evidence should be appended to the coroner's certificate when sent to the Registrar-General."

GREEK ARCHITECTURE.*

THE IONIC AND CORINTHIAN ORDERS.

TASTE, skill, and that artistic perception of what is right, and what is sufficient, so pervaded the artists and craftsmen of Greece that their works, be they in what material you please, are now, if not priceless, at least worth their weight in gold ; they are not only eagerly sought by all persons of taste and means throughout the world, but nations themselves struggle for their possession ; an engraved gem, a sword, a greave, a painted vase, an earthenware figure, a coin, or a piece of goldsmith's work, a horse's bit, or a potsherd, will often bring men of wealth and taste from the Antipodes to bid for it. The worst tyrants of Greece, like the worst tyrants of Italy, cherished any work of artistic perfection as their choicest possession. When Polycrates, the tyrant of Samos, on the advice of Amasis, tried to propitiate fortune by sacrificing his most loved possession, he threw his engraved signet gem into the sea ; five or six days after a fisherman caught a large fish and presented it to Polycrates ; the ring was found in the fish and eventually Polycrates was decoyed by Orœtes the Persian, to Magnesia and there crucified. It was the combination of natural perception, sense of propriety, and the determination of each craftsman to excel, that gives these often contemptible objects their priceless value. What is true of other arts is true of ours. Even in the fragment of a moulding we see the infinite care that has been bestowed on perfecting it, the subtlety of invention, and the propriety and appropriateness of what has been done.

There are a few things in Nature that look as if they had been done by a Greek craftsman. The shell of the king crab, for instance, and the small Indian water nut. I may here mention as an interesting fact, connecting England with Greece, that the first gold coin minted in England before the Roman invasion, was made by the Gauls resident here, and was a rude imitation of the Golden Stater of Philip of Macedon, the Gauls having possessed themselves of these coins during their invasion of Greece 280 B.C.

We really know very little about the daily life of the Greeks, so we can only conclude from induction that their simple wants were as admirably provided for by their architects as their artistic ones.

I once mentioned to an epicure that the Greeks must have had coarse palates, as they were so fond of assafœtida in their savoury sauces. He replied : "Nothing is more foul in smell and taste if used in large quantities ; but the slightest suspicion of it is most delicious —it is superior to the touch of garlic, without which no cookery is complete."

With the exception of a few ruined temples, gate-houses, basilicas, racecourses, theatres, and monuments, almost every vestige of Greek buildings seems to have perished. Yet I think we can have little doubt that when "Greece took rustic Latium" the Romans adopted or adapted most of the Greek buildings. We know that Greece eventually banished its conqueror's language in favour of its own, and the Greek language still flourishes, while the Latin is extinct. Plutarch died about 120 A.D.

Nothing remains, I believe, of the Greek private house (oikos) except what is preserved by words in Vitruvius, unless we include the houses at Pompeii and Herculaneum. When I was young nothing surprised me more than to read of the metallic palace of Alcinous, yet so late as Alexander the Great's time—B.C. 356-323 — Greek houses were so adorned. Plutarch tells us that "Phocion's house is shown to this day in the borough of Melita, adorned with some plates of copper, but otherwise plain and homely."

The main Greek buildings were the market-place and the meeting-place (*ἀγορά*), the town-hall (*πρυτανέιον*), the exercising-place (*παλαίστρα*), the racecourse (*στάδιον*), the bath (*βαλανέιον*), the hot baths (*θέρμαι*), the concert-room (*ωδεῖον*), the theatre (*θέατρον*), the lounge (*λέσχη*), the painted colonnade (*στοά ποικίλη*), the basilica (*στοά βασιλικη*), the treasury (*θησανρός*), though this was mostly the opisthodomus of a temple ; and the prison (*δεσμωτήριον*).

You are not to imagine that the Greeks were a humane people ; the torture of Phocion was loudly called for, though he had been forty-five times the General, and mostly the successful General of the Athenians, and was over eighty years of age.

In Plato's "Republic," Glaucon says :—"The just man will be scourged, racked, fettered, will have his eyes burnt out, and at last, after suffering every kind of torture, will be crucified."

In the fourth volume of the Antiquities of Ionia, published by the Dilettanti Society, plans of an Agora and a Stadium at Priene are shown that were contributed by Falkener, and in his Ephesus there are plans of others ; the Agoras seem to have been open squares, surrounded on three sides by walls and porticoes, while one side only was enclosed by a double portico, and they mostly had a fountain in the middle ; against the walls were shops or stalls, the porticoes forming a covered walk in front of them. Aristotle, in his "Politics" (Lib. 4, cap. 12, pp. 196-197), speaks of two markets, one for the sale of goods and the other the *free* or *upper* market. Speaking of the former, he says :—"For this market is *ex hypothis* reserved for the necessary business of life, whereas the upper market is a place in which to spend one's leisure, and which he says is not to be soiled by any marketable wares."

In looking at the Stadium at Priene, you will observe one side has many more seats than the other, and the high side is crowned with a crypto-porticus ; the reason of this inequality of height is not apparent, but Falkener was kind enough to explain it to me. The seats of the high side were cut out of the rock ; this not only saved expense but enabled those sitting up high to look over the lower seats on the opposite side into the country beyond ; and the crypto-porticus was not only useful as a lounge, but made a crowning feature when seen from the plain below. The racecourses were, in Greek times, about 600 Greek feet long = 606¼ English feet, and 625 Roman feet. That at Priene is 630 ft. according to Falkener, and was possibly Roman. It is greatly to be deplored that Falkener was not asked to give a description and sketches of this and the Agora, and also of the Altar in Athene Polias at Priene ; the latter has disappeared since he measured it.

Theatres were treated in a similar way to the stadia ; the seats, stairs, and passages of the semicircle were cut out of the rock, or hillside, so as to save expense, and partly to use the upper part of the hill as a sounding-board, and the semi-circle was usually crowned with a

* Professor Aitchison's fifth Royal Academy lecture, delivered on Monday, February 13.

crypto-portico and sometimes with an outside portico as well. On the ground floor alone the scene, the entrance-halls, crush-rooms, the staircases, and the actors' rooms had to be wholly constructed, mostly with a portico in front, and occasionally with an open court surrounded by crypto-porticoes. Several plans of theatres in Crete are to be found in Falkener's book on the subject, mostly copied from the illustrated MSS. of Onorio Belli, an Italian physician and dilettanti, who wrote it in 1556. At the town of Lysus, in Crete, Onorio Belli tells us there were three rows of the harmonic bronze vases I mentioned before, which he says "can be well seen in their cells."

The musical notation in Greek days appears to have been effected by the letters of the alphabet, both the capitals and italics. To extend their application, and to distinguish the various modes the letters were placed in different positions, the direct, the averted, the inverted, and the horizontal.

The modes were :—

The Hypo-dorian.	The Ionian.
„ Grave - Hypo-phygian.	„ Phygian.
„ Acute - Hypo-phygian.	„ Æolian.
„ Grave Hypoly-dian.	„ Lydian.
„ Acute Hypoly-dian.	„ Grave Mixo. Lydian.
„ Dorian.	„ Acute Mixo. Lydian.
	„ Hypomyxolydian.

Sir G. Grove tells me the Greeks had fourteen scales, of which we use two, the major and the minor; two others of the fourteen were accounted ugly, and fell into disuse, the balance is what are called Gregorian modes (or scales); out of these are formed the Gregorian tones, *i.e.*, tunes, to which the Psalms in the Roman Church and in many Anglican are still sung. I daresay a good many of us, when we have read those lines of Milton

> "And ever against eating cares,
> Lap me in soft Lydian airs,"

as little thought he was alluding to the Gregorian chants as that we owe the foundation of our music to Pythagoras, Aristoxĕnos, and Euclid.

The Greek theory of education was to train each citizen to the right conduct of business and the noble employment of leisure. Aristotle says both are requisite, at the same time leisure is preferable to business, and is the end of human existence ("Politics," Book v., cap. 3); and he tells us the four usual subjects of education are—1st, reading and writing; 2nd, gymnastic; 3rd, music; 4th, the art of design. As "gymnastic" meant all the exercises that were done naked, music meant not only the learning the lyre and the flute, but all the poetry, too, which was sung to these instruments, and, as the poets were supposed to be inspired, the works of Homer and Hesiod were looked upon much in the same light as we now look upon the Bible.

The Lesché or Lounge was at certain places decorated with paintings. Pausanias devotes many chapters to those paintings in the Lesché at Delphi by Polygnotus, and these subjects have been illustrated by Falkener in his Classical Museum. The paintings are believed to represent the Siege of Troy and the embodiment of Homer's Hymn, and it is believed that the pediments of the Parthenon represent the latter, taken from Polygnotus' pictures. By some the λέσχη has been represented in the shape of a temple with three outside walls and with one side in antis, without the wall of the pronaos, with a peristyle, and open in the middle; but Mr. Falkener believes it was not unlike a stadium, or a double stadium with a wall down the middle, surrounded on all sides by a portico, and with circular or semi-circular ends like those buildings found in Hadrian's villa at Tivoli.

I fancy the Greeks of the mainland used only tanks to bathe in, except when they had hot springs. Vitruvius tells us the Laconicum was so called from Laconia, from the hot baths of which the hot chamber was taken. The remains of baths and palæstræ in Ephesus have so much the air of Roman buildings that I have not thought it worth while to give you plans of them, and the same remark applies to the exercising rooms of the palæstra, and the sphairisteria, tennis or fives' courts.

We have all heard of the Seven Wonders of the Ancient World, though possibly but few of us could enumerate them; as they are all triumphs of the architect's or sculptor's art, I may safely name them, though I must tell you that different authors arrange their order differently, and give different ones—for instance, the labyrinth at Crete, and the altar made of horns by Lysippus at Delphi, are sometimes substituted for the ivory and gold statue of Phidias or the Pharos of Ptolemy at Olympia. Martial, unlike the parasite in "Gil Blas," was not so candid to Vespasian, but made the Flavian Amphitheatre not the eighth but the seventh wonder of the world.

> "Egypt, forbear thy pyramids to praise,
> A barb'rous work up to a wonder raise;
> Let Babylon cease th' incessant toil to prize,
> Which made her walls to such immenseness rise;
> Nor let th' Ephesians boast the curious art
> Which wonder to their temple does impart.
> Delos, dissemble, too, the high renown
> Which did thy horn-framed altar lately crown;
> Caria, to vaunt thy mausoleum spare,
> Sumptious for cost, and yet for art more rare,
> As not born up, but pendulous i' th' air.
> All works to Cæsar's theatre give place;
> This wonder Fame above the rest doth grace."
> (Anon, 1695).

They are now called—first, the Pyramids of Egypt; second, the Mausoleum; third, the Artemision at Ephesus; fourth, the walls and hanging gardens of Babylon; fifth, the colossus at Rhodes; sixth, the ivory and gold statue of Jupiter at Olympia; seventh, the lighthouse of Ptolemy Philadelphus.

As favourite subjects for architectural restoration, the Temple of Solomon, Porsenna's Tomb, the Mausoleum, the Artemision, and the Greek House, as described by Vitruvius, have been chosen. Hundreds of restorations of the Mausoleum have been made. Perhaps that which is not the least ingenious is the steeple of St. George's, Bloomsbury, by Nicholas Hawkesmore, Sir Christopher Wren's assistant and successor, who was not unfrequently associated with Sir J. Vanbrugh.

It is curious that the Mausoleum, which was so much admired and written about, which stood complete for at least 1,400 years, was never even decently described; and it is owing to the compiling industry of the Elder Pliny that in our time only have its ruins been absolutely identified, and some little more known about it. I give you the extracts from Strabo, 60 B.C.; Vitruvius, 80 to 11 B.C.; Martial, 43 to 104 A.D.; Pausanias, 174 A.D.; and Pliny, 23 to 79 A.D. I give Pliny last because he gives us a few dimensions.

Strabo, Lib. 14, cap. 2, 16. "Then follows Halicarnassus . . . . here is the sepulchre of Mausolus, one of the seven wonders of the world Artemesia erected in honour of her husband."

Vitruvius, Lib. 2, cap. 8, par. 11. "A terrace, in the middle of which the Mausoleum is built with such distinguished works, that it is called one of the wonders of the world."

Vitruvius, Lib. 7, proem par. 12. "Saturius and Phiteus wrote on the subject of the Mausoleum, and it was their real good fortune which conferred on them that highest and greatest task. For those men whose artistic powers are judged to have the highest praises up to the present time, and will have them in the future, also lent their exquisite workmanship to its design; I mean, that separate artists, Leochares, Bryaxis, Scopas, Praxitiles (and some think Timotheus also), in competition took their part on each front of the building in decorating it, and proving their own genius; and it was the extraordinary excellence of their art which pushed this work into the fame of one of the seven wonders."

Pausanias, 8, 16. "I know many sepulchres worthy of admiration, but I shall only mention two, one of which is in Halicarnassus, and the other in the land of the Hebrews. The former of these was raised for Mausolus, who reigned in Halicarnassus, and its magnitude is so prodigious, and its ornaments so magnificent, that the Romans, in consequence of the great admiration which it produced in them, call all their illustrious sepulchres Mausolea."

Martial (De spec : 1) :

> "Nor let the Carian town exalt so high
> Its Mausoleum hanging in the sky,"

Pliny (Book 36, cap. 4) :—"Scopas had for rivals and contemporaries Bryaxis, Timotheus, and Leochares, artists whom we are bound to mention together from the fact that they worked together at the Mausoleum; such being the name of the tomb that was erected by his wife Artemisia in honour of Mausolus, a petty king of Caria, who died in the second year of the hundred and seventh Olympiad" (his death is usually given in B.C. 353).

"It was through the exertions of these artists more particularly that this work came to be reckoned one of the seven wonders of the world. The circumference of this building is in all 440 ft. or 411 ft., and the breadth from north to south 63 ft., the two fronts being not so wide in extent. It is 25 cubits in height, and is surrounded with six and thirty columns, the outer circumference being known as the 'Pteron.' The east side was sculptured by Scopas, the north by Bryaxis, the south by Timotheus, and the west by Leochares; but, before their task was completed, Queen Artemisia died. They did not leave their work, however, until it was finished, considering that it was at once a memorial of their own fame and of the sculptor's art, and to this day even it is undecided which of them has excelled. A fifth artist also took part in the work, for above the Pteron there is a pyramid erected, equal in height to the building below, and formed of four-and-twenty steps, which gradually taper upwards towards the summit; a platform, crowned with a representation of a four-horse chariot by Pythis. This addition makes the total height of the work 140 ft."

The only other particulars are gathered from Hyginus, the Emperor Augustus's freed-man, who was Librarian to the Palatine Library (and whose description of the Mausoleum was discovered by Falkener).

The monument of King Mausolus, built of Parian, was 80 ft. high and 1,340 ft. round; by this latter dimension he is believed to have given its peribolus.

Sir C. Newton has given an extract from Guichard's "Funerailles des Rommaines," printed at Lyons in 1581, which is as follows :—

"The year 1522, when Sultan Solyman prepared to assault the Rhodians, the Grand Master knowing the importance of this place, and that the Turk ought not to encroach on it, at once sent several knights there to repair and put in order all that was necessary to sustain it against the enemy. Amongst them was the Commander De la Tourette, a Lyonese who was liberated after the taking of Rhodes and came to France, who gave the account which I am now going to relate to M. d'Alechamps, a personage well known by his learned writings, and whom I name solely that it may be known from whom I learned the history so remarkable. The knights having arrived at Mesy (now Budrum), began at once to fortify the castle; and to have lime, not finding any stone in the neighbourhood more fit to burn, nor found more easily, than certain steps of white marble which ran up in a flight in the midst of a field near the port, where the great square of Halicarnassus formerly was, they had these pulled down, and took them for this purpose. The stone being found good was the cause of their searching lower in the hopes of finding more when the little masonry that was above ground was demolished. This luckily succeeded; for in a short time they discovered that the lower they dug, the more the building spread out at the bottom; which furnished them with stone, not only to make lime, but to build with; at the end of four or five days after having made this great discovery, one day after dinner they saw an opening as if to enter a cellar; they took candles and let themselves down inside, where they found a fine great square hall, ornamented all round with marble columns, with their bases, capitals, architraves, friezes and cornices, sculptured in half relief; between the columns was covered with slabs, listels or fascias, of different coloured marbles, ornamented with mouldings and sculpture, in conformity with the rest of the work, properly arranged on the white ground of the walls, where nothing was seen but histories and battles in half relief. After having at first admired and then weighed in their imagination the singularity of the work, they at last pulled it down, broke and smashed it, to use it as they had the rest. Afterwards they found a low door, which led to another, like an antechamber, where there was a sepulchre with its vase and helmet of white marble, very beautiful, and wonderfully shining, which they did not open for want of time, the retreat having already sounded. The next day, after they had returned, they found the tomb uncovered, and the ground strewn with little bits of cloth of gold and spangles of the same metal; which made them think that the corsairs who swarmed along that coast, having got wind of what they had found there, had come in the night, taken off the cover of the tomb, and they held that they had found great riches and treasures.

Thus this superb tomb, accounted as one of the seven miracles and marvellous works of the world, after having escaped the fury of the barbarians and remained the space of 1,247 years standing, at least buried in the ruins of the town of Halicarnassus, was discovered and destroyed to repair the castle of St. Peter, by the Rhodian Knights of the Cross, who were immediately afterwards driven off by the Turk, and from all Asia as well."

It is believed that the Mausoleum stood in a more or less perfect state until the twelfth century, shortly after which it is supposed to have been partially destroyed by an earthquake, and was spoken of as remains by Cepio, who visited it in 1472 in Pietro Mocenigo's expedition.

We now come to the time when Lord Stratford de Redcliffe got the sculptured friezes that were built into the walls of the Castle of St. Peter, at Budrum, and presented them to the British Museum. The next is the arrival of Sir C. Newton, at Budrum; he was only concerned in the sculpture, so that the site of the foundation was covered up when Pullan arrived. As nothing but the remains of the quadriga, some of the steps of the pyramid, some pieces of the columns, and their entablature were found, he began by allowing a sufficient space for the quadriga, and then worked in the twenty-four steps from the remains found. This showed him the actual size of the bottom of the pyramid, and enabled him to set out the thirty-six columns—viz., nine at each end and eleven on each side, and the bases of these gave the stylobate 119 ft. by 88 ft. 6 in., allowing a space at each end for the lions, which make up 415 ft.—quite near enough to Pliny. By means of the remains of the coffering, Mr. Pullan obtained 63 ft. and 62 ft., as the sides of the chamber resembling the naos of a temple on the first floor behind the peristyle, and which he supposes to be the part mentioned by Pliny as 63 ft., only he does not attempt to construct the chamber according to Guichard either on the ground or first floor, and it is not to be supposed that a Knight of St. John, who had lived in the East, would call the sepulchral chamber, 22 ft. by 14 ft., a fine large square chamber.

I confess there is great difficulty about it; for if we suppose the steps were those of the pyramid *in situ*, what could have raised the ground 80 ft.? If, however, we suppose the steps had fallen in a mass on to the stylobate beneath, we still have over 40 ft. to account for, and even supposing the peribolus to have been surrounded with houses and other buildings, unless these had been heaped up, they could not all have fallen in that place, even supposing the peribolus itself was covered with houses too, over 40 ft., not to speak of 80 ft., is a great height to fill up; but if not, what becomes of Guichard's Hall and his statement that the mausoleum was buried in the ruins of the town?

It is most probable that the stylobate was ornamented with rows of sculptured friezes like the Neroon at Xanthus, of which there is a part and a complete model at the British Museum, but as there were no traces of these, Pullan has wisely omitted them; he gives the lower diameter of the columns as 3 ft. 5·35 in., taking the order at the proportion prescribed for Ionic columns by Vitruvius (Lib. 4, cap. 1), or 8½ diameters = 29 ft. 3½ in., and the measured entablature 8 ft. 6 in. = 37 ft. 9½ in., quite near enough to agree with Pliny's 37 ft. 6 in., this from the 80 ft. of Hyginus leaves 42 ft. 2½ in. for the stylobate. Pullan makes the total height of the steps of the pyramid 24 ft. 6 in., and to the head of Mausolus, in the quadriga from the platform on which it stands, 13 ft. 3½ in. = 37 ft. 9½ in., though I think it must have been higher, 14 ft. at least. Pliny gives the total height at 140 Roman feet = 136 English feet; this would allow a pedestal on the pyramid of 17 ft. 6 in., for it must be supposed that there was a high plinth on the cornice, at least as high as the projection of the sima. The top would then be much like the Lion tomb at Cnidos; to make the height agree with Pliny, we have only to take the 37 ft. 9½ in. to the top of the lower pedestal, which gives 11 ft. 9½ in. for the pedestal, and allow 4 ft. or 5 ft. to the bottom of the quadriga group as its base, like that of Cnidos.

The pyramid and square base of the lion tomb is 13 ft. 10 in., and thence to top of lion 18 ft., 6 ft. for the lion, about 6 ft. for its base, and plinth, and 5 ft. 6 in. for the pedestal on the pyramid.

The tomb of Cyrus at Pasargadœ is not very unlike the mausoleum, and as Cyrus died in 529 B.C., it may have partly served as a model. Arrian (Lib. 6, cap. 29) describes it as follows:—"The basis thereof consisted of one large stone of a quadrangular form. Above was a small edifice, with an arched roof of stone, and a door or entrance so very narrow that the slenderest man could scarce pass through. Within this edifice was the golden coffin, wherein the body of Cyrus was preserved."

All the ornament of the mausoleum was picked out in red and blue, and the marble appears to have been coloured dull yellow.

The splendid drawing by the late F. P. Cockerell, from Professor Cockerell's restoration (done before Pullan had made out the size of the pyramid, as the peristyle is made dipteral), was presented to the British Museum by Mrs. F. P. Cockerell. Falkener (in the Classical Museum) and Mr. Watkiss Lloyd restored the mausoleum as a dipteral building. Vitruvius says the mausoleum had been pushed into the rank of one of the Seven Wonders of the World by the excellence of the sculpture: so he evidently did not think much of it as an architectural triumph. I think we may say that Professor Cockerell much exceeded Satyrus and Phiteus in designing skill, for I think most of you will agree with me in considering it a most elegant design for a king's tomb.

We find from Vitruvius (Pro. Lib. 7) that "Ctesiphon of Gnossus and his son Metagenes built the Artemision, and also that it was afterwards completed by Demetrius, a priest of Diana, and Pæonius the Ephesian. Pæonius and Daphnis the Milesian built the Temple of Apollo at Miletus of the Ionic order." This completion was the rebuilding after it was burnt down at the death of Socrates in 399 B.C.

I may here remark that such is the influence of writing, that our own brother Vitruvius, who was acquainted with the books, does not seem to be aware that the Artemision of his time, the eighth, was built by Alexander the Great's architect; for the aliases he chose to go by concern his fame and not us. Vitruvius calls him Dinocrates; Strabo, Cheirocrates; and Plutarch, Stasicrates. The sixth temple must have been very splendid, since Xerxes spared it, on account of its magnificence, and either this or the seventh of Pæonius seems to have had sculptured drums to the columns and to have had the simas or (ἐπιτίθιδες) sculptured with figures, both of which may be seen at the British Museum.

Pliny (Lib. 36, cap. 56) tells us that at one of these eight temples, the first Ionic columns, or at least volutes were first used, and that in addition to these columns there are what are called attic columns, quadrangular, with equal sides, which I do not think has been noticed before. Mr. A. S. Murray pointed out to Fergusson that the square pedestals found by Wood had once had columns on them, and Fergusson adopted this theory in his restoration. With the exception of laudatory remarks on the temple, the only particulars are, I believe, given by Pliny, which I now give you:—

Pliny. Book 36, cap. 21 (14): "The Temple of Diana at Ephesus.—The most wonderful monument of Grecian magnificence, and one that merits our genuine admiration is the Temple of Diana, at Ephesus, which took 120 years—more commonly stated as 220 years—in building; a work in which all Asia joined. A marshy soil was selected for its site, in order that it might not suffer from earthquakes or the chasms which they produce. On the other hand, again, that the foundations of so vast a pile might not have to rest upon a loose and shifting bed, layers of trodden charcoal were placed beneath, with fleeces covered with wool upon the top of them. The entire length of the temple is 425 ft.—413 ft. 1 in. English—and the breadth, 225 ft.—218 ft. 7 in. The columns are 127 in number and 60 ft. in height, about 58 ft. 4 in. English; each of them presented by a different king. Thirty-six of these columns are carved, and one of them by the hand of Scopas. Chersiphron was the architect who presided over the work. The great marvel in this building is, how such ponderous architraves could possibly have been raised to so great a height. This, however, the architect effected by means of bags filled with sand, which he piled up upon an inclined plane, until they reached beyond the capitals of the columns; then, as he gradually emptied the lower bags, the architraves insensibly settled in the places assigned them. But the greatest difficulty of all was found in laying the lintel, which he placed over the entrance doors. It was an enormous mass of stone, and by no possibility could it be brought to lie level upon the jambs which formed its bed; in consequence of which the architect was driven to such a state of anxiety and desperation as to contemplate suicide. Wearied and quite worn out by such thoughts as these, during the night, they say, he beheld in a dream the goddess in honour of whom the temple was being erected, who exhorted him to live on, for she herself had placed the stone in its proper position, and such, in fact, next morning was found to be the case, the stone apparently having come to the proper level by dint of its own weight. The other decorations of this work would suffice to fill many volumes."

Pliny by the 220 years must mean the last three temples built on the same site, for the seventh temple was burnt by Erostratus the day Alexander the Great was born, B.C. 356.

The blundering of our Government when anything connected with the arts is in their hands cannot be too strongly deplored. The first object is to discourage and, if possible, extinguish the obnoxious proposition; when this fails, to exercise, in the first instance, the greatest parsimony, and this usually entails the most lavish expenditure, with the least possible results. Nothing can illustrate this better than the proceedings at Ephesus. 1st. Wood was to find out the site of the temple at his own expense. Small sums were then doled out, until the temple was found; when it, and some of the marbles were found, a grant was made, but one insufficient for a perfect exploration; the work was then abandoned, and is so to this day, long before there is any assurance that still more valuable results may not be obtained by excavations up to and beyond its peribolus. This information would be most valuable to architects, antiquaries, and scholars. In England the book is left to haphazard publication, for if it does not strike a publisher as being likely to pay well, and if the explorer is not a man of fortune, even the little knowledge obtained will in all probability be lost for ever to the public who has paid the expense of the expedition. In this case, nothing but a popular book has been published, while it is of the utmost importance that the most perfect records should be published of what has been found by the discoverer. At Ephesus, for instance, theatres and other buildings were explored as well as the Temple.

In France a learned antiquarian or two, who have devoted themselves to the subject, are usually associated with two architects, and a competent figure draughtsman, and a complete and erudite book is published most perfectly and beautifully illustrated.

A topographical map and a plan of the town should be in the room at the British Museum, a model of the site showing where each fragment was found, and a model of the Temple restored to its pristine condition, with the colouring and accessories, to make the discoveries even comprehensible to the general public. I trust it is not too late for the Government to have a properly illustrated book of these discoveries published. You will be astonished to hear that the works of Sir C. Newton and Mr. Pullan on the Mausoleum were published at their own expense.

Fergusson in one of his numerous restorations has shown how the 127 columns may be got in by using an odd one at the end of the posticum, which with great probability was used, for the back of the Temple was hidden from general view by a hill. It also seems likely that the sculptured bases, besides those of the front, were put on the flank next the town, where they could always be seen. His theory about there being a sculptured stylobate, instead of steps on three sides, must remain an open question, though Wood has some evidence on his side from Philo, who gives ten instead of fourteen steps. These sculptured drums alone are original, beautiful, and unique, not to speak of the square pedestals, and would give unusual magnificence to the building. I would beg you to notice this invention; nothing is altered in the Ionic column, a piece of figure sculptor's work is simply introduced in the place of the lower part of the fluting. I have also not thought it worth while to give an illustration of this temple, as it is in no wise different from others, except in the sculpture on the columns I am indebted to Mr. A. S. Murray for the loan of his restoration. The ornamental sculpture on the neckings at the Erechtheion is a similar invention.

I will say a few words on the favourite subject for sculpture in the Artemision, the Mausoleum, and some of the Athenian buildings—the Amazons. They have been dismissed as fabulous, and the celebrated interview of Alexander the Great with them and their Queen as merely a May-day show; but Mr. Tyler, who has lately been lecturing on the Hittites, gives the following remarks, and assigns their habitation to the River Thermodon, in Pontus, and you may recollect that Herr Puchstein and M. Chipiez tell us it is from Cappadocia that we may look for the beginnings of Greek art and civilisation.

"But here," said Mr. Tyler, pointing to another part of the storied field, "was a long procession of women, each having what might be regarded as an unstrung bow, and their appearance altogether was in accord with that character of warrior-priestesses which had been attributed to the Amazons. Moreover, there was the striking fact that Boghaz-Reni was not far distant from the locality which the Greeks assigned as the head-quarters of the Amazons by the River Thermodon. If it was contended that the Amazons were purely legendary, these sculptures might be looked upon, at any rate, as showing that the story of these female warriors was believed in what might be called their own country. There was, moreover, in the Hamath inscriptions what looked like the indication of female warriors armed with club and sword."

In the rapid sketch of Greek architecture I have given you, I have shown you a model of artistic perfection that has never been surpassed, that has not even been equalled by the gifted races of Etruria and its neighbourhood; I have shown you what has been achieved by a profound knowledge of geometry applied to proportion, and to the grace and subtlety that has accrued in the working up of a commonplace type by a highly sensitive and gifted people; and I have hinted at the increased interest to be gained by combining the arts of sculpture and painting with our own. Xenophon, in his memoirs of Socrates, tells us that a celebrated wrestler said "he could tell his pupils from others by the bearing of their bodies, even when they went to the shambles for meat." I hope we may in future know the buildings of an Academy student by their truth, the charm of their proportion, their beauty, and the perfection of their details.

I must return my thanks to so many for the assistance they have lent me that I might almost fill one lecture with them. To Mr. A. S. Murray, to the South Kensington Museum for Fergusson's model of the Parthenon, to Professor Smith for the favour of his diagram, to the "Guardian" Fire Office for their chromolithograph, to Sir G. Grove, Mr. Holmes, Mr. Tadema, and a host of other private friends, for information, translations, books and suggestions.

TERRA-COTTA.*

I DOUBT if at any time when great works were erected it has ever before been open to the architect and the contractor to build in so many different ways, and use such various materials. Consider for a moment what was in use when Westminster Abbey was erected. We find in that building only stone of various sorts, including marble, sand and lime, timber, lead, glass, tiles, and a very sparing use of iron, and no other materials. If we come down to the erection of St. Paul's we find the same materials with the addition of brick and copper. At the present day we have, in addition to these, one entirely new material, namely, Portland cement, one virtually new, namely, steel, never till now available for structural purposes. We have the natural cements, such as Roman cement, &c.; and we have concrete in various forms, artificial stone, sundry metals, and lastly, terra-cotta. These additional materials (save Portland cement) are developments or new applications or revivals of materials already known to the world, and though virtually new to us are not new to the art of building.

Among these revived and developed materials terra-cotta is taking an important place; it is being extensively employed, and this being so, I have thought that it might very suitably form the subject of a lecture in this course, and that photographs showing its use in ancient and in more modern but past times, and in our own day, might usefully serve as illustrations.

* A lecture delivered at Carpenters' Hall by Professor Roger Smith, on the 21st ult.

The name terra-cotta is Italian, and, literally translated, means "burnt earth"—a title which, of course, might include bricks, but the term is always understood as meaning a material made of finer earth than the brickmaker uses, and more thoroughly burnt; a material to be employed in building for decorative purposes, and usually made in blocks larger than bricks, and of a different shape. Terra-cotta is *not*, however, artificial stone, and it partakes more of the nature of brick than of stone. While stone is wrought with the chisel or the pick from the block in a hard state, terra-cotta is modelled or cast in the plastic clay or earth in a soft state, and then dried and fired. Stone, it is true, is used, as is terra-cotta, to finish or ornament a building, but most of the ornaments, mouldings, and features which can be readily cut out of stone with a chisel are different from what can be readily modelled in soft clay, or cast in that material in a mould. There is, accordingly, a proper terra-cotta treatment, and a proper stone treatment, of ornament, and to deal with terra-cotta as if it were artificial stone is not to use the material the best way.

Terra-cotta belongs to the most ancient of the articles man has manufactured. To quote Sir Charles Lyell "burnt bricks, jars, vases—the human figure in burnt clay—are found in the remains of submerged towns, in the channels of the Nile and Upper Egypt, in the Mexican buried cities of America, and elsewhere, as the enduring types of the civilisation of peoples and races whose names even are not known in the pages of history. Granite disintegrates and tumbles into particles of mica, quartz, and felspar. Marble soon moulders into dust of carbonate of lime, but hard, well-burnt clay endures for ever in the ancient landmarks of mankind."

The earliest specimens of terra-cotta that we have—and they are of very great antiquity—were not manufactured for building purposes or for ornament, but for the very dissimilar purpose of writing materials.

The ancient Babylonians, Assyrians, and Egyptians used to prepare tablets of clay, to write on them while soft with a pointed stick, and then to fire them. A tablet such as one can hold in the hand, or a small cylinder, covered with writing, was made to hold a long inscription, and practically indestructible. The famous Tel Amarna letters were tablets of this sort. There are hundreds of these tablets in the British Museum. To many of the most ancient of them is ascribed an antiquity of not less than 3,000 years, and to some even more, and they can be read with ease (by those who know the language) to-day, so indestructible a material is terra-cotta.

The first nations to use terra-cotta for many purposes of ornament (so far as we know) were the Etruscans and the Greeks. The Etruscans were the people who lived in the central part of Italy before the Roman day. The country they occupied extended from Rome to Florence, and they have left behind them the remains of

Terra-cotta Statues. (British Museum.)

many cities, with cemeteries, and in the tombs of their cemeteries they had the habit of burying jars and ornaments of terra-cotta, some of which were made in the country, while others were brought from Greece. They made large funereal chests, or sarcophagi, of this material. A sarcophagus was a glorified sort of coffin, large enough to contain a corpse, and was intended to bear on the lid a life-sized effigy of the deceased, executed in terra-cotta.

Sarcophagi are represented in the British Museum by two fine specimens, one a little more than 2,000 years old (say 2,100), the other much more antique and singular, and probably at least 400 years older. The points that will interest you most about these curious specimens are the perfect preservation in which they have come down to us, and the singular mastery of a difficult manufacture which had been attained so long ago. I doubt if Lambeth at the present day would find it easy to turn out such large specimens of terra-cotta better or more free from defects.

Beyond mentioning the subject I shall not speak to you about Greek and Etruscan terra-cotta vases, for they seem to have more relationship to pottery than to building, but there is another manufacture of ancient terra-cotta which I cannot bring myself quite to pass over: I allude to the statues, chiefly, but not always, those miniature statues, which are usually known as statuettes. These seem to have been favourite ornaments of the Greeks and Romans, and of the people influenced in their tastes by Greek civilisation, and they were very frequently placed in tombs, where most of those now in our own and other museums have been found.

These statuettes were *cast* in moulds, and many of them are graceful and pleasing to the last degree. You can find hundreds of them at the British Museum, ranging in age from 2,600 years to 1,800, or thereabouts, and still more in Paris. In addition to their great beauty, they illustrate for us the ease with which ornamental work can be reproduced in terra-cotta, and the extraordinary durability of that material under reasonably favourable conditions.

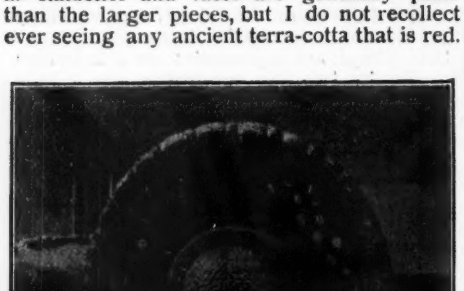
Coming now to that which more nearly interests us, namely, the application of terra-cotta to building, we have in the British Museum an illustration of the striking antiquity of its use, brought, like the great sarcophagus which I have already referred to, from the buried remains of an Etruscan city. It had been understood from classic writers that it was customary in Etruria to erect buildings partly of timber and enrich them with ornaments done in terra-cotta, and consequently specimens of the ornaments so used have been sought for. Some have at last been dug up in Civita Lavinia, near Rome. These are attributed to the sixth century before the Christian era, that is to say are now 2,500 years old, or thereabouts. They are of Greek design, and possibly Greek manufacture. What is shown

Frieze from Civita Lavinia (Etruscan). (British Museum.)

is part of the side cornice of a building, believed to have been a small Greek temple, with part of the ornamental frieze which crowned the wall. The sloping cornice of a pediment or enriched gable end, and a series of extremely elaborate and striking ornaments known by the Greek name of *antefixæ*, which were employed at intervals along the line of eaves. The great beauty of this work will strike the eye, and the capacity of terra-cotta for receiving ornament is illustrated by it.

From the same place a series of ornamented slabs have been obtained, which appear to have been fastened by bronze pins to a timber structure, and a considerable number of such slabs have been found at Civita Castellana, the ancient Falerii, an Etruscan site, and are now in a museum at Rome.

The colour of all this terra-cotta is of brownish cream colour, very similar to the colour of most of the terra-cotta in use in London now. The very fine specimens, such as statuettes and vases are generally paler than the larger pieces, but I do not recollect ever seeing any ancient terra-cotta that is red.



Acroterion from Civita Lavinia (Etruscan). (British Museum.)

At Civita Castellana remains of the terra-cotta cornice of a building of very similar character to those set up in the British Museum have also been found and taken to Rome, and are described in an Italian archæological publication. Taking these two examples as illustrating one another, it seems clear that the terra-cotta was secured to a simple, timber-framed structure with a span roof having a gable at each end. The roof was covered with large flat tiles of terra-cotta with a flange at each edge. Each joint was covered by a large terra-cotta roll. The underside of some of the tiles was painted for a few inches, indicating by how much they had overhung at the eaves. At the end of each of the rolls just alluded to was a large and rich ornament known as an antefixa. This rose about 18 in. above the eaves. It was fixed at right angles to the plane of the roof, and consequently sloping a little forwards. The ornament was held in place by a stout terra-cotta strut which went back to the roll, and there still can be seen in the Falerii example the carefully formed opening through which a pin, no doubt of bronze, was passed to fix the whole securely to the timbers. Below the eaves the wall was enriched with plaques covered with rich ornament.

At the gable ends there was secured to the timber a moulded and enriched cornice of considerable height but of little projection, ending in a hollow crowning moulding and having two large beads and secured to the roof by curved struts similar to those of the antefixæ—two to each length of cornice. In the example now in London this cornice is painted, and the marks of the careful steady brush held some twenty-five centuries ago by some Etruscan ornamenter can be followed to-day by us in this specimen of his handiwork now stored in Bloomsbury.

Some ornamental tiles, for which it is hard to find a place, were found at the same spot, but there can be little doubt as to the position of a tile adapted to be the central ornament which crowned the gable of the Civita Castellana example, and they have found at the same place other tiles on which the same ornament runs from right to left in some, and from left to right in others, showing that they were what we call purpose-made, and intended to go right and left from the centre of the gable.

By the courtesy of Dr. Murray, Mr. Elsey Smith has been permitted to take some photographs for you at the Museum, and these will illustrate some of the matters just described.

Terra-cotta seems to have practically dropped out of use for a thousand years and more, and we next meet with it in certain countries during the Middle Ages, and still more frequently when matters were ripening for that outburst of revived Classic which we call the Renaissance, and which is the starting point for all modern art. Its use was resumed chiefly in countries where stone is scarce and timber not used in abundance, such as the alluvial plains of North Italy, Holland and the Netherlands, South-Western France, and many parts of North Germany and of Spain.

The material does not seem to have been much employed, if at all, in the comparatively rude buildings erected before the great church-building age of Europe, namely, the thirteenth, fourteenth, and fifteenth centuries; it is met with much more frequently on buildings of the fourteenth and fifteenth century than in those of the earlier century. When the great change of taste occurred at the end of the fifteenth century terra-cotta held its ground for some time. It is true that in the buildings which were almost direct copies of ancient Roman ones, with columns, cornices, and porticoes, it was little employed; but it was freely used in those buildings which abound in the early stage of the Renaissance, where the new Classic features and ornaments and the Gothic ones are more or less blended, and where comparatively small arches and windows and profuse ornament were introduced; and it gradually went out of use as the general taste in architecture turned towards big features, such as could be best executed in stone or marble.

The cities of Milan and Pavia contain the finest examples of the use of this material, and nowhere is it so appropriately employed as in the Certora or Charterhouse of Pavia, a great Carthusian monastery, with cloisters and a large church of great richness and beauty; but in many other North Italian towns good specimens can be found.

Generally speaking, the terra-cotta there employed is in small blocks of very nearly the same coloured red as the bricks with which it is used, and very richly covered with cast ornament. Nothing to suggest that it is an artificial stone occurs. It always impresses one as a refined and ornamental brick, and this circumstance makes the Italian terra-cotta extremely useful to the designer.

In England, very few examples earlier than the Renaissance are to be found; still there are a small number of Gothic buildings with terra-cotta panels and other ornaments, and the beautiful moulded brick chimneys and ornaments of Tudor mansions may be claimed as coming within our range. When the sixteenth century brought to this country the new architectural style, the employment of terra-cotta became more customary. There are, for example, a series of terra-cotta busts of Roman Emperors used as ornaments at Hampton Court Palace, and other works in the same material at the same building; and two well-known monuments in terra-cotta, dating from early in the sixteenth century, stood in the old Rolls Chapel till it was very recently pulled down.

In Norfolk and Suffolk—counties where stone has to be brought from a distance—there exist a considerable number of mansions dating from about this time, in which terra-cotta, partly in the shape of fine moulded brick, is used for almost all the ornamental work; and the same thing occurs occasionally in other southern and western counties. In the shape of moulded and enriched brick, especially for the cornices and chimneys of domestic buildings, the use of material analogous to terra-cotta continued through the seventeenth century, and to some extent in the eighteenth.

The modern employment of terra-cotta may be said to date from as far back as 1786, when a Miss Coade started a factory in Lambeth for terra-cotta and artificial stone. It stood near where Eastwood's wharf now is, and under various names continued till about thirty years ago. A good many pieces of sculpture were executed here, among them the pediment at Greenwich Hospital, representing the death of Nelson. Rossi and Bubb, who, it is said, had been employed at Coade's works, and afterwards set up for themselves, executed, among other works, the eight figures called caryatidæ, standing at the north and south porticoes of St. Pancras Church, and the antefixæ, or small erect ornaments, on the principal cornice. These must have been set up about the year 1819, and so have been standing eighty years. The statues were executed in tolerably large blocks, and, though much discoloured by smoke, they appear to have stood the London climate extremely well; and the antefixæ, exposed to the full force of the weather, appear to be quite complete and in good condition, and, unless they have been renewed, their condition is a tribute to the durability of terra-cotta in the London atmosphere.

The names of Blashfield, Blanchard and Doulton, Gibbs and Canning, Pulham and Edwards are among those which become prominent in the more recent development of terra-cotta. In the hands of these and other manufacturers it has been to a remarkable extent employed as a building material.

For some of these and other details I am partly indebted to a very exhaustive paper by Mr. Charles Barry in the "Proceedings of the Royal Institute of British Architects."

The more recent use of terra-cotta for important buildings may be said to be associated with South Kensington. The Science Schools; the Albert Hall, by General Scott; the Natural History Museum, by Mr. Waterhouse; and more recently the Central Technical Institute by the same architect, and the Imperial Institute, by Mr. Collcutt show specimens of its use; the Natural History Museum being an especially important example. In other parts of London one may point to the Constitutional Clubhouse, by Mr. Edis; the Palace Theatre and City Bank, Ludgate Hill, by Mr. Collcutt; and the Prudential Insurance Company, by Mr. Waterhouse. Two very large terra-cotta hotels are now building.

The number of buildings in London of more moderate extent in which the material is employed is now so very great that it is not possible to do more than refer to one or two conspicuous instances. In Essex-street, Strand, there is a remarkable Renaissance front (by Mr. Gordon) covered with well-designed ornament, and well worth examining, as showing the capabilities of the material. Even more striking is the front of a recent building by the same architect in Parliament-street, near Whitehall, where the finely-worked terra-cotta enrichments are combined with brickwork. Here, however, there is in some respects an attempt to disguise the terra-cotta as stone. The theatre at Peckham, by Mr. Ernest Runtz, is a good recent instance of the successful employment of this material in which it is quite possible to fail as well as to succeed. Witness its employment in the recasting of the Russell-square houses.

Terra-cotta is now manufactured with a high glaze and of various colours—in which condition it resembles faïence or glazed earthenware, and the two materials can both be employed and can be combined alike in the exterior and the interior of a building. Only a few days ago the President of the Royal Institute of British Architects said from his official chair that it was "refreshing even to think of London and other manufacturing towns presenting us with beautifully-coloured and enriched fronts that do not want painting every year," and regretted that "coloured and glazed materials for external facings, where the greatest beauty of colour and form may be used," were so rarely employed. This is now within reach, and the Birkbeck Bank in Southampton Buildings, Chancery-lane, the design of Mr. T. E. Knightly, for which Messrs. Doulton made the terra cotta and faïence, is an unusual example of this employment of glazed and coloured materials. The extensive and extremely striking interior is not yet open to the public; and I shall therefore only say that when it is so open it will be well worth the while of any one having any interest in the subject of this night's lecture to inspect it.

I have not sought for opportunities of showing you in the lantern what you can so easily see for yourselves in London streets; but I am glad to be able by the kind assistance of professional friends to show you what has been done in Birmingham.

The Assize Courts, the work of Mr. Aston Webb and Mr. Ingres Bell, are executed entirely in terra cotta inside and out. The building is ornate but very effective, and the ornament, though it is profusely employed in parts of the building, does not interfere with the general breadth and dignity of effect, and is itself appropriate and beautiful.

The new hospital, the work of Mr. William Henman, who has most kindly caused photographic slides to be made for you, is a building of red brick with red terra-cotta enrichments, and very great pains have been taken to make the most appropriate use of the material, and Mr. Henman has introduced allegorical figures, modelled by Mr. J. Wenlock Rollins, of Chelsea, some of which appear in the photographs. He has attached importance to the surface given to the terra-cotta made for him by Messrs. Doulton. This is granular. "I had noticed," he writes, "that most terra-cotta cracked all over its surface and eventually much of the face peels off, and after careful observation, extending over some time, I came to the conclusion that it was caused by the slight glaze on most terra-cotta. This results from silica coming to the surface in the act of drying before burning.

This glazed surface is naturally cold and of greater density than the substance of the terra-cotta. Unequal contraction and expansion cause the cracking. Condensation on the cold surface, and frost cause the peeling. It, therefore, seemed to me that by corrugating or rather granulating the surface the cracking might be prevented, and, consequently, the peeling. The result has been most successful in this respect, and the general appearance is, in the opinion of all who have expressed their views to me, greatly to be preferred to the partially glazed effects."

I propose here to say a little about the manufacture and qualities of the material and later on something about its artistic capabilities.

Terra-cotta is a refined kind of brick; and, like brick, it varies in colour, texture, and durability. Speaking generally, the principal ingredient is either fire-clay or one of the fine plastic clays fit for use in making good earthenware, such as are found in Dorset, Devon, and Cornwall. This is generally mixed with a portion of fine sand and of old pottery or terra-cotta ground to a fine powder. The proportions—especially in cases where it is found best to mix two and more sorts of clay together—are the secret of the manufacturer, and are the result chiefly of experiment. Sometimes other ingredients are added with a view to serve as a flux to promote the fusion of the whole mass in the kiln. Much pains is taken to secure that all the materials shall be thoroughly and most intimately mixed, as the success of terra-cotta largely depends upon the material being quite uniform all through, so as to dry and burn uniformly, for warping and getting uneven and out of shape, is the disaster of which there is the greatest danger. The prepared material is moistened with water and so brought to a state in which it can be moulded.

For building-blocks a model is made of each sort of block required, from this a plaster mould is taken, and the clay is pressed into that mould and the piece so cast is carefully dried in hot air, and in drying becomes tolerably hard and firm. During the drying it shrinks, and if there be unequal shrinkage it warps and may be spoilt.

Sometimes terra-cotta work is not cast, or only parts of it are cast. In what is called the "direct work" process it may be modelled by hand, or ornamental pieces may be built up. This gives the opportunity for employing original work, varying from work of the highest artistic character to simple enrichments modelled in clay instead of being carved in stone, but capable of being undercut as castings cannot be.

The pieces of terra-cotta when dried are burnt in a kiln. It is possible to correct small irregularities that have shown themselves as the result of drying before burning.

The kiln is usually what is called a muffle kiln, that is to say, a kiln with a lining of brickwork within, and separate from the fabric of the kiln itself, so that the flame may not play direct on the goods. There is, I believe, room for a good deal of skill, or the reverse, in the charging of the kiln. It takes, roughly, a ton of coal to burn a ton of terra-cotta. The heat developed is very great, and the result ought to be to fuse or vitrify the entire mass of each bit of the material. In firing, the ware is commonly subjected to the action of a salt glaze, and the surface, after firing, ought to stand a test which I had best describe in the words of Sir Henry Doulton: "Take a sharp-pointed steel instrument, and if you can make an incision with it in the terra-cotta the tooth of time will attack it; but if it turns the sharp point of the steel you may be sure it is imperishable. The other test is acid, which in a short time will test its durability." On leaving the kilns the terra-cotta is very carefully and slowly allowed to cool.

The finished blocks do not ordinarily exceed from 3 ft. to 4 ft. cube, and in many cases are much smaller than that. Their height and their depth from front to back should be arranged so as to bond with brickwork. The blocks are always made hollow, partly to economise valuable material, partly to secure that the heat of the kiln shall completely pervade every part of the material. The ends of the block are, of course, solid, and if it is of any size one or more cross-pieces are formed to strengthen the sides and front; the back is usually open. It is customary and desirable, notwithstanding that terra-cotta is very strong, to fill up the hollow space with cement concrete, made with rather fine materials. Some authorities prefer Roman cement for this purpose, since some specimens of Portland, especially if not air-slaked, swell a little, and this is liable to crack the blocks if it occurs.*

The finished piece of terra-cotta has shrunk from what it was when moulded. Part of the shrinkage takes place in the drying, part in the burning, but the usual result is that it is about one-thirteenth smaller every way. If, therefore, you desire to produce a block measuring 12 in. by 6 in. by 9 in., your mould must be 13 in. by 6½ in. by 9¾ in. This introduces one of the difficulties with which the manufacturer has to contend. The detail drawings sent by the architect show the size and shape that the finished article must be. The manufacturer or the architect has to redraw the whole to an enlarged scale and make the model to that enlarged scale, and the labour involved in this enlargement is often very great, nor is it always quite certain that the shrinkage will be exactly what is anticipated.

A further difficulty rises out of the irregularities which spring up in the kiln. Lines that ought to be straight are wavy. Surfaces that ought to be true are a little curved or hollow. The colour also is not always quite uniform when the articles are compared with one another. Where the heat has been greatest, the terra-cotta may prove to be darker than the average; and either the irregularity in shrinkage, in truth of line and surface, and in colour of exterior may be enough to cause a block to be unfit for use, much more if it is defective in more respects than one. There is also a liability to fire-cracks.

The advantages which terra-cotta possesses over stone are, first, the invaluable one that it is, when exposed to an acid atmosphere, more durable, being practically indestructible when good. Secondly, that it is cheaper, and if much enriched, considerably cheaper than stone. Thirdly, that it admits more readily of high-class original sculpture, or, at least, original modelling; and, fourthly, that it admits—nay invites—a profuse use of appropriate ornaments, that is to say, such as can be cast in a mould and repeated many times over. Lastly, the colour is often good and is very much under control; and the material is far more suitable for use with brickwork than stone.

There are some minor advantages and some applications to modern uses to be named. It is stronger than stone, and yet lighter, which is advantageous for carriage, hoisting, and handling. Its surface does not readily hold impurities, so that it remains clean, and the rains wash it, and when used inside a building it can readily be cleansed. It is more available for casing in the structural ironwork of a building so as to protect it in case of fire, than any other material, and when so used it can be run into suitable shapes or ornamented without interfering with its usefulness as a fire jacket. Terra-cotta tubes make the best smoke flues and ventilating flues, and terra-cotta bars are now often used to go from joist to joist in fireproof floors and to carry the concrete or tiles.†

The drawbacks to the use of terra-cotta are, however, not few, and some of them are serious. The first and the most important is that it involves delay, and it is not, like masonry, prepared on the job.

From the time when the manufacturer receives the drawings till the delivery of the first cargo on the work you may fairly reckon on a delay of not less than six weeks at the very least, and then it may be that the blocks wanted first come to hand last, and, what is worse, that some block which is essential does not come at all, or comes too short or too long, or in some other way deficient or defective, and must be replaced. It is fortunate if the new block can be obtained in a month, and meantime it is quite conceivable that the brickwork of a whole wall, or even of a whole building, has to stand still. Of course, this may happen more than once in the course of a large building, and it is no exaggeration to say that months of delay may be, and often are, occasioned by this circumstance if there happens to be a run of bad luck or of misfortune.

Then the work being not prepared on the spot, it is difficult, often impossible, to make the most desirable modification in a building during progress, and all the business of templates and dimensions and generally fitting what would be the masonry to the rest of the work is most liable to go wrong, and necessarily becomes troublesome.

If a block which is of importance comes so different in colour that it cannot be accepted, or if it must be rejected on account of a defect, the consequences may be so serious that neither the architect nor the contractor feel half as free to deal with this material as they would with masonry. If the terra-cotta be thoroughly vitrified it is almost impossible to cut it or shape it in any way if it is in the slightest degree a misfit, and yet, owing to the warping and shrinkage which I have described, this material is peculiarly liable to be here and there thrown out of shape, even with the utmost care, and this calamity sometimes seems to pursue one particular piece, which may come to hand out of shape twice or three times running.

The remedy—as far as it can be remedied—for this class of drawback is to be found in extra vigilance—above all, a greater degree of forethought than is required with any other building material whatever; extremely good and careful general and working drawings made long beforehand, and a steadfast refusal to make any changes in the work during progress. One expedient which is sometimes attempted I strongly object to—the arranging matters so that the brickwork can be put up first and the terra-cotta added afterwards. This is not structural, and it of course adds to expense very greatly; but there are circumstances when even this desperate expedient must be resorted to; and in that case the ease with which terra-cotta can be shaped renders it possible to devise tolerably good arrangements for fixing it after the structure is up.

It is undoubtedly a drawback that the material cannot well be obtained with perfectly true straight lines and perfectly even surfaces. The curved pieces are also liable to be a little out of truth, but if the blocks are small it can be generally so set by a superior workman that this is not easily detected.

Terra-cotta in long lengths for lintels and cills is not obtainable. It can be joggle-jointed, as may be seen in many cases where it is employed, just as in Mediæval work the mantels of fireplaces were jointed; but some will feel that this is an imperfect substitute for a lintel in one piece.

In the Italian Gothic examples what one may call terra-cotta bricks chiefly occur; that is to say, the blocks are comparatively small, are moulded and enriched profusely with such ornaments as are easily cast repeated frequently, and are built up along with the bricks into the features of the architecture. They do not differ very greatly from the brickwork in colour, but they do differ in fineness of texture and surface, in sharpness, and in being ornamented. Here I think we have an example of the best employment of terra-cotta for the ornamentation of a building. The whole is perfectly harmonious and the ornamental part is quite appropriately similar to the plainer part, differing only just so much as is necessary to accentuate it. In London examples exactly similar in treatment are not numerous, but a fine one with red brickwork and red terra-cotta ornament is Mr. Waterhouse's St. Paul's School at Hammersmith, a building of Tudor character. The same architect has used the same materials in a fine Tudor dwelling-house near Putney Heath. His rebuilding of University College Hospital makes use of the same materials in a Renaissance design, and promises when the scaffold is struck to be a very effective exterior. The Birmingham Hospital is another good example. The same effect is obtained with sharper ornament though at heavier expense in many of the best modern red-brick exteriors when the enrichments have been carved out of the brickwork

* Specimens of building blocks of various shapes and colours were lent as illustrations by Messrs. Doulton and by Coalville, Sandford, & Alston, Limited.

† The experiments of Mr. Kirkaldy, quoted by Mr. Charles Barry in his paper on this subject, read before the Institute, and in the "Dictionary of Architecture," give the following results:—

A cube, of 6 in. by 6 in. by 6 in., of Portland stone—
Cracked under 283 tons per foot
Crushed ,, 292 ,, ,,
A similar cube of Bath (quarry not stated)—
Cracked under 88 tons per foot
Crushed ,, 104 ,, ,,
A cubic block of solid terra-cotta, same size—
Cracked under 442 tons per foot super.
Crushed ,, 523 ,, ,,
Another experiment gave a block, a foot cube, as crushing, 664 tons.
A hollow block, about 6 in. by 6 in. by 11 in.—
Cracked under 22 tons, the block
Crushed ,, 80 ,, ,,
Similar block, chambered—
Cracked under 46 tons
Crushed ,, 186 ,,
Similar block, filled with Roman cement—
Cracked under 45 tons
Crushed ,, 163 ,,

by hand. Mr. Norman Shaw and other architects have some excellent work of this sort.

In some of the late Italian examples the terra-cotta is more distinct from the body of the brickwork, and is of a different colour. This, I think, is so in part of the Certosa at Pavia. The features of this building, and of others similar to it, are usually small, and such and so enriched as can be easily and naturally executed in a material cast in moulds, and obtainable in moderate sized pieces. It is hard to overrate the beauty of some of the work at the Certosa. Among modern architects Mr. Collcutt seems to have best secured the class of effect I am alluding to. His Palace Theatre, his City Bank on Ludgate Hill, and his Imperial Institute are good specimens of buildings in which terra-cotta, in bands and in features and enrichments, is used simply and naturally; and the spectator can be in no doubt at the first glance that they have been designed specially to suit the material employed as their principal enrichment. Then there comes what must be called the stone treatment. In scale and in design the architectural forms, and sometimes the enrichments, are of a size and of a shape just such, or nearly such, as would have occurred had stone been the material, and the whole face of the building is of terra-cotta. Now there is a good deal to be said for such a treatment, especially in cities with a smoky and an acid atmosphere like London, but it represses the peculiarities of the material to some extent instead of bringing them out, and so far is less satisfactory.

For a manufacturing town, however, such as Birmingham, and especially for London, there is a great inducement to make use of terra-cotta as a substitute for stone simply because it will stand when stone will fail, and it will keep clean when stone will blacken, and because also stone is a very costly material to use in profusion, and terra-cotta is cheaper.

The science schools building on the east side of Exhibition-road has a series of columns of considerable size, in the design of which the artist (the late Mr. Godfry Sykes) has shown great intelligence. He has divided his column into heights by bands, which have enabled the manufacturer to produce a large column in a series of sections of not unmanageable size, and he has twisted his shafts, a proceeding which, dispensing with straightness, is particularly suitable when dealing with a material which it is not easy to get straight. I have always looked upon these as suggesting possibilities in the use of terra-cotta which other architects have not yet attempted to grasp.

The quality of terra-cotta which is the highest of all, and which is capable of producing the most brilliant results, is certainly one which has been not fully developed yet, and in which, consequently, lie the greatest possibilities for the artist of the future. I allude to its capacity for receiving and rendering permanent the original modelling of a sculptor or modeller. Plastic clay is the material in which the sculptor does the essential part of his work, and if, instead of the slow, laborious, and expensive process (largely mechanical) of transferring the modelled work to marble, stone, or bronze, the model itself can simply be baked and fired, and so made permanent, we bring the sculptor close to the public. We can have original work, in the production of which almost all of the fee goes to the artist, and comparatively a mere trifle is spent on costly material or manual labour, or anything else.

In many cases a not extravagant outlay would enrich the interior or the exterior of a building with noble and entirely original sculpture; not cast in a mould, but the actual work of the sculptor's own hand. I am able to show you, by the courtesy of Mr. James Doulton, photographs of several of the works of Mr. Tinworth, a sculptor who has worked in this material for years, and whose original, vigorous, and very striking compositions have a great charm. If any of you will visit that architectural gem, the interior of the Guards' Chapel, you will see some of Tinworth's work in panels there, and will appreciate how much they contribute to add life as well as beauty to that interior. It is quite possible for any architect who has a modest sum at his command for the ornamentation of his building to enrich it with panels such as those by Tinworth which I am to show you, or to dignify the exterior with sculpture such as Mr. Henman has been able to introduce at Birmingham.

But work of far less pretension—a spandrel, a tympanum, some ornament to fit a single panel, can be had in most cases where it would be appropriate to employ it; and nothing is more valuable than even a single piece of original work of this class in adding dignity to an entire building.

To sum up in one sentence what appears to grow out of our examination of terra-cotta as a material for the architect's use, we may, I think, say that terra-cotta seems to be at its best when it is used along with brickwork (though this is not absolutely essential); when it is used in a building that is ornate rather than plain, and is employed in smallish blocks; when there is much enrichment, and much repetition of the same enrichment or ornament, but not many plain arrises and mouldings; when cornices have greater height than projection; when numerous small features are employed rather than a small number of bold ones; when use is made of the facility with which an ornament can be moulded and repeated; and last, but very far, indeed, from least, when original modelling is to some extent employed.

What there may be in reserve for us in the near future from the employment of glazed and coloured terra-cotta I do not pretend to prophesy, but that its use will become a conspicuous feature in the design of street buildings I cannot doubt. I sincerely hope that it will be taken up by architects who will employ it with good taste and self-restraint.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

THE Committee of this Institute appointed according to the resolution passed at the general meeting on January 16 have met and are considering the question of the administration of building by-laws in rural districts. They would be glad to receive any suggestions from members. Such communications to be addressed to the Secretary of the Institute.

A special general meeting will be held on Monday, the 6th inst., to elect the Royal Gold Medallist for the current year. The Chairman to move: "That, subject to her Majesty's gracious sanction, the royal gold medal for the promotion of architecture be presented this year to Mr. George Frederick Bodley, A.R.A., for his executed works as an architect."

The ninth general meeting (business and ordinary) will then be held, when the election of candidates for membership will take place.

Mr. Henry Dawson will subsequently move "That, with the object of securing correct legal action in the election of candidates for membership of this Institute, the members thereof request the Council to obtain, at the earliest convenient date, the written opinion of some eminent Queen's Counsel of independent position, as to whether women are eligible as Associates or Fellows under the terms and provisions of the existing Charter and By-laws of the Royal Institute of British Architects. And that the Council do report such opinion to the members at the earliest convenient date."

Mr. Owen Fleming will move "That the attitude of the Council towards the brickwork experiments recently conducted by the Science Standing Committee is calculated to impair public confidence in the Royal Institute, and that the Council therefore be invited to take such steps as may be necessary to bring the matter to a satisfactory conclusion."

Mr. H. Hardwicke Langston will also move "That in the opinion of this meeting it is desirable to put a suitable and prominent inscription on the street front of No. 9, Conduit-street, indicating that those premises are occupied by the Royal Institute of British Architects."

At the conclusion of the foregoing business the meeting will be open to non-members, and the following paper will be read, "Some Early Christian Churches in Palestine," by Mr. A. C. Dickie, with lantern-slide illustrations.

OPEN SPACES, LONDON.—It is announced that Colonel Sexby, chief of the Parks Department, L.C.C., is engaged in preparing for publication a history of the Municipal Parks, Gardens, and Open Spaces of London, which amount to thirty-one in all. The book, which will contain a large number of illustrations, will comprise descriptions of the tenures under which the lands are severally held, and of their historical and other associations, together with accounts of some houses and buildings around them.

THE ARCHITECTURAL ASSOCIATION DISCUSSION SECTION.

THE ninth meeting of the Discussion Section of the Architectural Association was held at 56, Great Marlborough-street, W., on the 24th ult., Mr. H. J. Leaming in the chair. A paper by Mr. H. V. Crawfurth Smith on "Heraldry" was read.

The author, commencing with a short account of the origin of heraldry, explained some of the terms employed (mostly derived from Norman-French) as escutcheon, marshalling, &c., also the use of colour for heraldic purposes generally. He pointed out how, when heraldry reached its glory at the commencement of the eleventh century—and for three centuries following—dresses, hangings, furniture, armour (even ecclesiastical vestments emblazoned with the arms of the donor), were all enriched with the rank, family, &c., of the wearer or owner. A "rebus," a pun upon a name (as a man falling, for "I-slip" in Bishop Islip's Chapel in Westminster Abbey), was very far from uncommon. Thus in the Middle Ages all was treated in a thoroughly decorative manner down to the smallest details.

In glancing at the revival of heraldy, Mr. Crawfurth Smith mentioned especially the name of A. W. Pugin in his thorough and good work in the Houses of Parliament, and concluded his paper by showing that in the robes of the Garter, of the Judges, and of the great State functionaries there still lingered with us reminiscences of the great science of heraldry.

The discussion was opened by Mr. Weymouth, followed by Mr. Hopkins. Mr. Swinfen Harris remarked that heraldry was a science as well as an art, and that it was to be judged by its peers (like architecture), and *not* by the public. None should overlook the religious side—where shields, &c., were not so much to display one's pride as one's faith. He noticed, too, how the helmet of the king was full-faced, as commanding, and of the nobility, turned to the left as listening. So also knights and barons full-faced; squires to the left, listening. Mr. Harris called attention to the Franciscan church at Innsbruck, with the great bronze figures in armour, calling it a heraldic delight, so thoroughly had everything connected with heraldry been worked out.

Mr. Matt. Garbutt, Mr. George Smith, and the Chairman continued the discussion, Mr. Crawfurth Smith replying to the vote of thanks. Some hangings, with heraldic devices, were kindly lent by Messrs. Storey, of Kensington, showing use of heraldic badges, &c., decoratively treated.

The next meeting of the section was announced for Friday, March 10, when a paper is to be read by Mr. H. C. Corlette on "Colour."

THE LONDON COUNTY COUNCIL.

THE usual weekly meeting of this Council was held on Tuesday, in the County Hall, Spring-gardens, Mr. T. McKinnon Wood, Chairman, presiding.

Engineering Contracts.—Mr. Beachcroft presented a petition from the London District Association of Engineers and Shipbuilding Employers, asking for consideration by the Council of the difficulties felt by them in regard to the clauses which were inserted in the Council's contracts relating to dismissal of foremen, and the determination of all disputes as regards the contract by the simple fiat of the Council's officers, and the enforcement of a schedule rate of wages. Also with reference to the hardships inflicted upon the London engineering trade by the restrictions as to the cubical area of workshops contained in the London Building Act, and asking that the Council would consider the advisability of obtaining some modification with the view of putting the London engineering trade upon an equal footing with their competitors outside the London area. The petition represented sixty firms, paying upwards of 1,200,000*l.* a year in wages.

The petition was referred to the General Purposes Committee and the Building Act Committee.

Loans.—On the recommendation of the Finance Committee it was agreed to lend the Camberwell Vestry 22,200*l.* for the purchase of sites; the Clerkenwell Vestry 3,005*l.* for sewage works; the St. Paul, Deptford, Vestry 700*l.* for furniture and fittings, &c., at baths and washhouses; and the Wandsworth and Clap-

ham Union 5,150*l.* for purchase of site for offices, &c.

Fulham Palace-road Improvement.—On the recommendation of the Improvements Committee it was agreed that the estimate of 5,084*l.* submitted by the Finance Committee be approved, and that, subject to the Vestry of Hammersmith enfranchising the copyhold of the land to be added to the public way, and subject to the road being widened to not less than 45 ft., the Council do give its consent to and do contribute, on the usual conditions, one-half of the net cost of the setting back of the western side of Fulham Palace-road between Carnforth Lodge and the "Duke of Cornwall" public-house, such contribution not to exceed the sum of 5,084*l.*

Enlargement and Alteration of the Clerkenwell Fire Station.—The Fire Brigade Committee submitted a long report embodying correspondence in regard to the enlargement and alteration of the Clerkenwell fire station. The amount of the accepted tender, by Messrs. Munday & Sons, was 6,286*l.*, but in consequence of delay in getting possession of the site and the subsequent rise in the price of materials, &c., the contractor submitted an account of a considerable excess. The Fire Brigade Committee now recommended, and it was agreed, that the arrangement made between the architect and Messrs. G. S. Munday & Sons with regard to the balance of the amount payable to the firm under their contract in respect of the enlargement and alteration of the Clerkenwell fire-station be approved, and that the Council do sanction a further expenditure of 2,694*l.* 14s. 6d. in respect of such work.

Improvements.—The Improvements Committee made the following recommendations, which were agreed to :—

"That the estimate of 4,025*l.*, submitted by the Finance Committee, be approved, and that the Council do contribute on the usual conditions one-half of the net cost of widening Church-street at the "Three Crowns" public-house, and at Nos. 2, 4, 6, and 8, as shown upon the plan forwarded by the Vestry of Stoke Newington, such contribution not to exceed the sum of 4,025*l.*, it being understood that the Vestry shall continue the widening of the street from time to time as opportunity occurs."

"That the estimate of 2,763*l.*, submitted by the Finance Committee, be approved, and that the Council do contribute on the usual conditions one-half of the net cost of the reconstruction of the bridge and approaches carrying Westbourne-terrace-road over the Grand Junction Canal, as shown upon the plans submitted by the Vestry of Paddington, such contribution not to exceed the sum of 2,763*l.*"

"That the amount of the Council's contribution to the Limehouse District Board, in respect of the widening of Narrow-street, at Nos. 39, 41, 43, 45, and 47, be 396*l.* 13s. 4d. . . ."

"That a payment of 3,000*l.* be made to the Wandsworth District Board on account of the Council's promised contribution in respect of the widening of Lower Richmond-road. . . ."

"That the amount of the Council's contribution to the City Corporation, in respect of the widening of Ludgate-hill, between St. Martin's-court and Pilgrim-street, be 15,887*l.* 11s. 1d. . . ."

Battersea Park Bandstand.—The Parks and Open Spaces Committee recommended, and it was agreed :—

"That the Council do approve the estimate of 594*l.* submitted by the Finance Committee, and do authorise the construction in Battersea Park of a permanent bandstand in accordance with the design prepared by the Architect; that the tender of Messrs. McDowell, Stevens, & Co. to execute the ironwork of the superstructure as specified, for the sum of 314*l.*, be accepted; and that the Committee be authorised to obtain tenders for the construction of the foundations and platform and the painting work, and to enter into any necessary contracts in the matter.

Walls and Fences, Southwark Park.—The same Committee recommended, and it was agreed :—

"That, subject to the passing of the annual maintenance votes for 1899-1900, the Council do authorise an expenditure of 1,242*l.* for the erection of a close oak pale fence, with iron capping, between Southwark Park and adjoining property, and the repair of the existing wall and fencing at other portions of the boundary; that the tender of Messrs. Rowland Brothers to carry out the work for the sum of 1,242*l.* be accepted."

Smoke Consumption.—Mr. Bull moved to refer to the Public Control Committee to consider the advisability of offering a reward of 1,000*l.* for a patent smoke consumer adaptable to modern private grates.

The resolution was rejected, and the Council soon after adjourned.

THE BUILDERS' FOREMEN AND CLERKS OF WORKS INSTITUTION.

THE annual dinner of the Provident Institution of Builders' Foremen and Clerks of Works was held last Saturday in the King's Hall, Holborn Restaurant. Mr. Joseph Randall, A.M.Inst.C.E. (Messrs. Kirk & Randall), presided, being supported by Messrs. Benjamin Tabberer, W.H. Strudwick, H.W. Horner (Ashby & Horner), T. Costigan (Secretary Central Association of Master Builders), and others. Over 480 members and friends of the Institution sat down to dinner.

The loyal toast having been honoured,

The Chairman gave the toast of the evening, "The Provident Institution of Builders' Foremen and Clerks of Works." Having alluded to the loss the Institution has sustained in the death of Mr. G. Plucknett, F.S.A. (who for thirty years had held the position of Governor, and for several years previous was a trustee) and Mr. W. H. Sharpington, a hard-working director of the Institution, the Chairman gave some information about the Institution and its excellent work. In the course of his remarks he said the men's pension is now 12s. a week, and he believed that the proposal was being considered to increase that sum to 15s. a week. They now had over twenty pensioners who were receiving about 350*l.* per annum, and so carefully were the affairs of the Institution managed that the working expenses were only about 70*l.* per annum. Society appeared to be separating into two classes — the savers and the wasters, the provident and the improvident, the thrifty and the thriftless — and he asked his hearers to help the thrifty — to help the Institution to carry on its good work in assisting those who, through ill-health or other circumstances, might be unable to provide for themselves or their families. In many large towns in the country the example set by the London foremen and clerks of works has been followed and similar institutions have been started and supported by builders and others.

Mr. W. H. Bedford, in response, said that the Institution had been in existence fifty-seven years, and during the last forty-eight years 30 male pensioners had received 3,183*l.*, 54 widows had received 6,427*l.*, 10 orphans 351*l.*, and 960*l.* had been paid to afflicted members—making a total of nearly 11,000*l.*

Mr. Horner then gave the toast of "The Architects and Surveyors." The duties of architects were becoming more difficult, for an architect had now to make himself familiar with such matters as electric light, steel construction, &c.; he was expected to be both an artist and a man of business, and it was his business to approach the client and smooth over matters with the builder. He (the speaker) had been reading a little history of Sir Christopher Wren, whose remuneration was about 4d. an hour, and whose name was scarcely known in London until many years after his death. In the same way he was afraid that the names of many eminent architects would remain unknown until after their death. Critics had been heard to condemn that fine building on the Embankment (New Scotland Yard), but he ventured to think that the name of its architect, Mr. Norman Shaw, would be known long after the names of the critics were forgotten. With the toast he coupled the names of Mr. Tabberer and Mr. Strudwick.

Mr. Tabberer, in responding for the architects, said that architects highly appreciated the abilities displayed by builders' foremen and clerks of works.

Mr. Strudwick, for the surveyors, said that in the course of a few years, possibly, the Government would deal with the question of old-age pensions, and if they did he hoped that an Institution like the Builders' Foremen's, which had done so much for its members, would have special consideration.

Mr. J. Stapleton then proposed "Builders and Contractors." In the course of his remarks he said that matters between builders and their men had come to a crisis, and the question had to be decided whether builders and contractors were to manage their own businesses or have them managed by the workmen. It was time for the masters to be firm, for the more they yielded the more would be demanded of them.

Mr. T. Gregory having briefly replied,

Mr. F. Hann proposed the toast of "The Governor (Mr. F. J. Dove), Trustees (Messrs. Dove, J. Howard Colls, and W. Scrivener), Donors, Honorary Subscribers, and Visitors."

Mr. T. Costigan, in response, said that it was a most creditable fact that the cost of administration of the funds of the Institution was so little. The aims of the Institution were deserving of every support, and he thought everything promised even greater success for the future than had been achieved in the past.

The remaining toasts were "The Chairman," proposed by Mr. John Beer, hon. secretary, and "The Press."

During the evening, subscriptions and donations to the amount of 130*l.* were announced, the Chairman giving 21*l.* and the Central Association of Master Builders 10*l.* 10s.

METROPOLITAN ASYLUMS BOARD.

SIR EDWIN GALSWORTHY presided on Saturday last at the fortnightly meeting of the Managers of the Metropolitan Asylums District, held at the County Hall, Spring-gardens.

Surveyor to the Board.—The Works Committee recommended that the managers should appoint a permanent surveyor, to be under their control, who should give his whole time to the service, prepare plans and specifications, and discharge all the duties of an architect and surveyor. They proposed that the officer to be elected should have special knowledge of sanitary and draining work, should be under forty years old, and should receive a salary of 500*l.* with travelling expenses, office accommodation, and assistance.—The Rev. G. W. Pope protested against the proposal to appoint a surveyor, and said they ought to have a competent architect instead. Mr. J. H. Brass objected to putting the officer under the Works Committee. Already they had an Engineer at 600*l.* a year, and the Works Committee would never let them have a look at that officer. Only a fortnight ago the Committee refused to allow the services of the Surveyor to the South-Western Hospital. On the suggestion of Mr. Purchese, the Chairman of the Committee, Mr. A. C. Scovell, agreed to omit the provision that the officer should be under the control of his Committee. With regard to the question of salary, Mr. J. H. Lile said he considered it a great mistake to advertise for an officer at such a low salary. He did not believe they would get a good man under 600*l.* or 700*l.* a year. Recently the London County Council advertised for an architect at 1,500*l.* a year, but could not get a suitable man and had to advertise for one at 2,000*l.* A man was needed who had had practical experience elsewhere, and he would not think it worth while to come for 500*l.* a year. He moved an amendment that the salary should be 650*l.* The Hon. Maude Stanley seconded. Mr. Edward White, L.C.C., was satisfied that suitable men would not be prevented from applying by the difference between 500*l.* and 650*l.* This was an experiment, and if it turned out well, doubtless the Committee would propose the appointment of an architect to the Board. They did not desire to make the appointment too important at first. The officer would have to begin single-handed, and a staff would gradually gather round him. If he were asked to begin by taking charge of an establishment ready formed, it might be worth while to offer more, but he hoped they would get, not a man who had failed as an architect on his own account, but a rising young man—say, first assistant to a good firm, who would make the office worth more as he learned the work. The Rev. G. W. Pope considered that they should have appointed a Surveyor at 400*l.* subordinate to the Engineer. If there was to be a new department let it be a good one, and let them have an architect. Mr. Lile having withdrawn his amendment, a suggestion was made by Mr. Monson that the Committee already had a man for the place, and that advertising would be a farce. This was indignantly repudiated by the Chairman of the Committee as "without a shadow of foundation," and the report was adopted.

Appointment.—Mr. W. T. Farthing was appointed to take out the quantities of the Joyce Green Hospital buildings.

ELECTRIC LIGHTING SCHEME FOR HACKNEY.—After seven months' consideration the Electric Lighting Committee of the Hackney Vestry have issued a report, prepared by Mr. R. Hammond, electrical engineer, and the Committee recommend the Vestry to adopt an electric lighting scheme therein set out, which will cost, exclusive of charges for the site of the works, 242,367*l.*

DRAWINGS FOR THE ROYAL ACADEMY.

As usual, we shall be glad to forward to the Royal Academy any drawings sent to the office of this journal in time to be photographed for publication (if considered suitable) before sending them in.

The last day for receiving drawings at the Royal Academy is Monday, March 27; and the latest time at which we can receive any to be delivered from this office is *11 a.m. on Saturday the 25th.* Any drawings sent here later than that we cannot take charge of.

The following are the requirements of the Royal Academy in regard to drawings:—

1. That every drawing should be in a gilt frame.
2. That there should be a label affixed to the back of it giving the title of the drawing and the artist's name and address, and the distinguishing number of the drawing (if more than one is sent).
3. That a similar label should be affixed to the frame by a string, so as to hang over in front.
4. That the drawing be accompanied by a letter to the secretary of the Royal Academy containing the same information as on the labels.

We can take charge of no drawings which do not comply with these regulations. *We cannot provide or affix labels where they have been omitted by the sender of the drawing.*

Illustrations.

ILLUSTRATIONS OF GREEK ARCHITECTURE.

THE illustrations of the Propylæa and of the monument of Lysicrates at Athens, taken from two fine photographs, are given in connexion with Professor's Aitchison's lectures on Greek architecture. There is a pathetic as well as an architectural interest in them. The remains of that beautiful little conception known as the monument of Lysicrates stand, a battered relic of a great past, in the midst of the modern buildings some of which exhibit a kind of faint effort at a revival of Greek spirit, while others are of purely utilitarian character.

The view of the remains of the Propylæa is taken in front of the remains of the stone staircase up which the Athenian population crowded on high days and holidays, to pay their adoration to the tutelary goddess whose statue was enshrined in the most perfectly designed temple the world has seen. The steps and the columns of the Propylæa, though half ruined, still recall and suggest the effect of the once-stately entrance to the sacred enclosure.

"THE CROFT," TOTTERIDGE.

THIS house is situated facing Totteridge Green, Herts. and is built of thin red brick, with Ancaster stone mullions and jambs to the ground floor, and oak windows to the first floor. The upper portion of the walls is finished in rough cast and the roofs are covered with old plain tiles.

The architect is Mr. T. E. Collcutt. The drawing was exhibited at last year's Royal Academy exhibition.

A COUNTRY HOUSE, GARDEN FRONT.

THIS pleasing and quiet elevation for a country house, by Mr. Geo. O. Scorer, was exhibited at the Royal Academy last year.

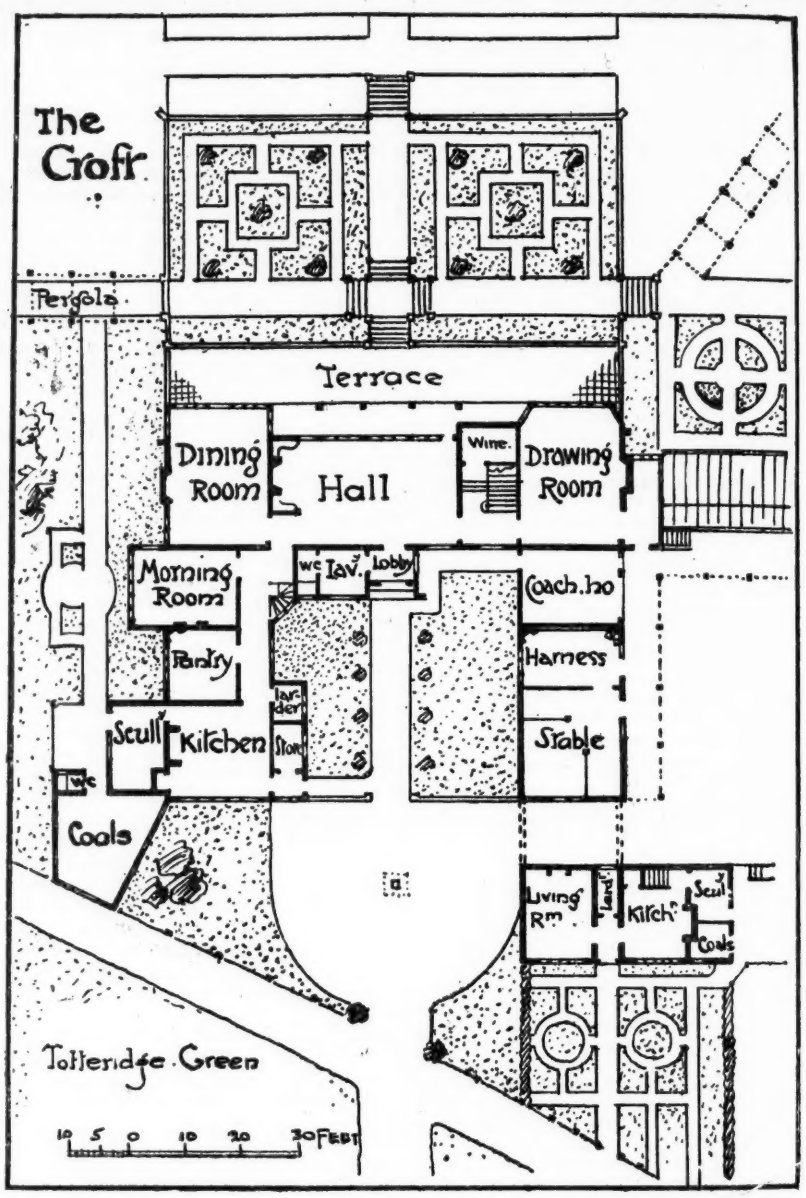
Owing to the author's absence from town we have not been able to obtain a plan and description from him in time for publication.

PARISH INSTITUTE, PORTSEA.

THE building illustrated is the Parish Institute of St. Mary's, Portsea, which was opened by Mr. Goschen in October, 1898. The building consists of four class-rooms and lavatories on the ground floor and staircases, and on the first floor a class-room, kitchen, scullery, &c., and a long hall, 98 ft. 6 in. by 35 ft. by 24 ft. 9 in. high from floor to ceiling, which is illustrated herewith. As it was essential that the floor space should be uninterrupted, steel principals were designed to span the hall. These are stayed at the foot by steel joists running across in the thickness of the floor and rivetted, and the principals are cased in plaster to form flat ribs. Fawcett's system has been used for the fire-proof floors.

The materials are red Fareham bricks, with gauged brick and Portland stone dressings, Maidenhead tiles for the roof, and a wood lantern with copper cupola. The building has been carried out by Messrs. Ward & Co., builders, of Portsea, from the designs and under the superintendence of Mr. Reginald Blomfield, architect.

We gave an illustration of the proposed design about a year ago, from a drawing exhibited at the Royal Academy. The present illustration is from a photograph from the building, which has been somewhat modified in execution.



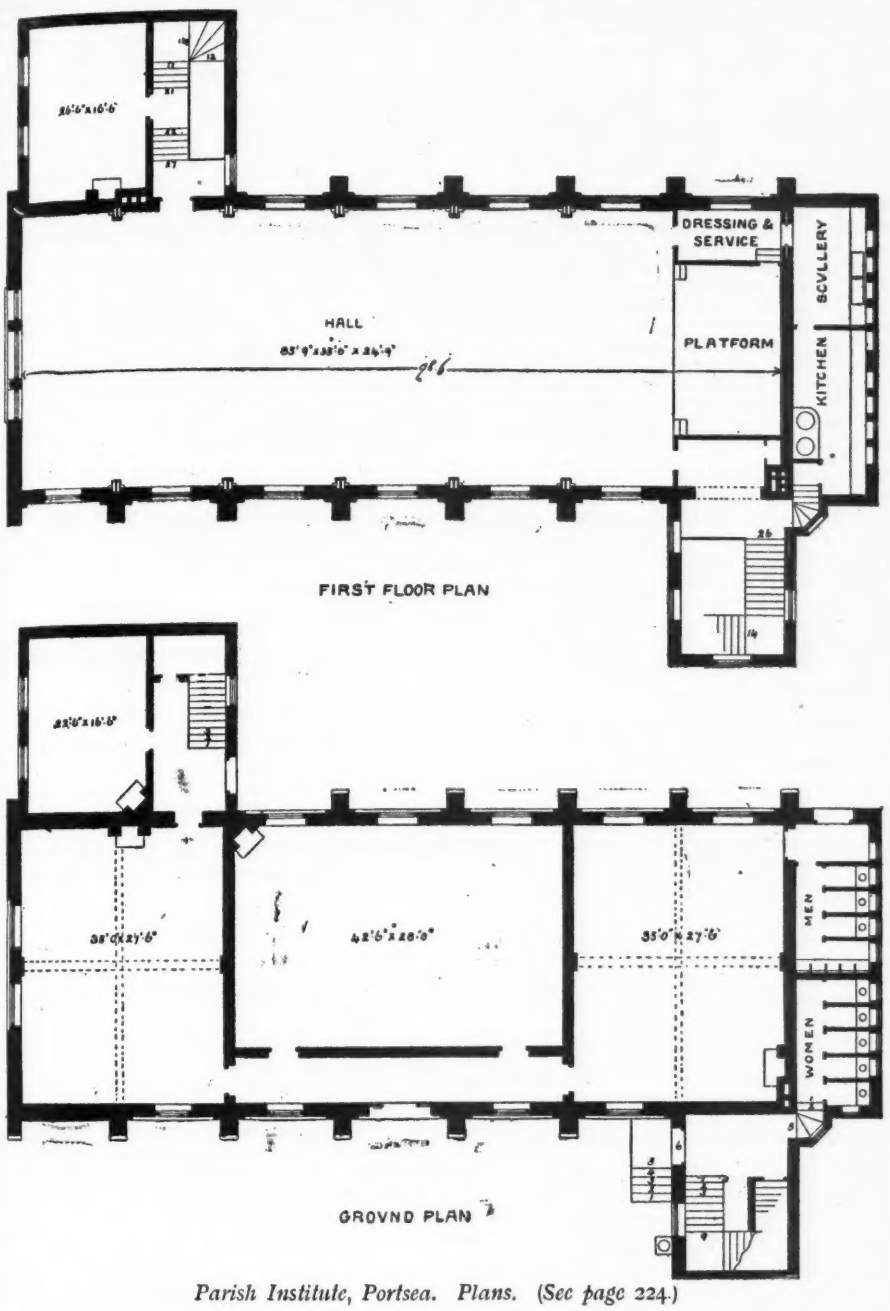
MEMORIAL PULPIT, FARNHAM, SURREY.

THIS pulpit has been erected in the parish church of Farnham, Surrey, in memory of Canon Hoste, for many years rector of the parish.

The materials are wainscot oak, ebony, and coromandel wood. The columns are inlaid with ebony reedings, and the large moulding below the swags is covered with a veneer of coromandel wood. In the original design it was intended to fill the panels with designs in intarsia work, using such woods as yew, cherry, and box, the idea being to carry up the colour scheme started by the coromandel wood below. This idea was abandoned to meet the wishes of the committee, and carved and moulded panels were carried out instead. The winding staircase is necessitated by the plan of the pier against which the pulpit is fitted. The whole of the work, with the exception of the brass lectern by Messrs. Elsley (which is not shown in the illustration), has been carried out by Mr. W. Bessant, from the designs and under the superintendence of Mr. Reginald Blomfield, architect.

ARCHITECTURAL SOCIETIES.

GLASGOW ARCHITECTURAL ASSOCIATION.—At the usual fortnightly meeting held in the rooms, 187, Pitt-street, Mr. Wm. J. Anderson delivered a lecture entitled "Impressions of a Mediterranean Trip," describing, mostly in a light and humorous manner, a cruise by way of Algiers and Malta to Athens, and a return journey by Corfu, Naples, Nice, and the Loire district of France, for purposes of architectural study. Among impressions of the tour which he indicated were, the feeling that good design and largeness of conception had been evinced in the planning and extension of most Continental cities, while they were almost wholly absent from our own, and that there existed an aspiration for something beyond the fulfilment of mere material necessities in their public buildings. This was to be attributed, especially in the case of France, which in such matters led the Continent, to the steadying influence of sound traditions of architectural education, which, in permeating society with the understanding and the love of art, fostered the desire as well as provided the talent for its realisation. More particularly have we to learn the lesson in so-called engineering works such as bridges, railway stations, markets, &c., which in France are often among the most successful works of its brilliant school of architects. No question of art was at all comparable to the need for the improvement of our cities in these respects, and for skilled control of the development of their plan. In an Anglo-Saxon community it would almost seem as if the provision for animal necessities was sufficient, and that to aspire in our handiwork after anything nobler than the aims of the bird and beaver was to be hopelessly Utopian and unpractical. Concluding, the lecturer urged the claims of a more extended historical study of architecture, not for practical reasons only, but as examples of the higher manifestations of Nature, reaching us through the human spiri



Parish Institute, Portsea. Plans. (*See page 224.*)

whose path, in relation to every essential matter of progress, was marked by its monuments.

EDINBURGH ARCHITECTURAL ASSOCIATION.—The second series of visits of members of the Edinburgh Architectural Association for this session took place on the 25th ult. In the forenoon the visitors were entertained and shown through Milton House Works, Abbey-hill, belonging to Messrs. James Milne & Son, Limited. These works, which cover from two and a half to three acres of ground, provide employment for between 700 and 800 workers, comprise an engineering department, in which malting and paper-making machinery is largely made; water fittings shop, castings shop, gas-fittings shop, smiths' shops, and gas-apparatus shops. After lunch in Milton House Hall, Mr. Ross, President of the Association, proposed a vote of thanks to Messrs. Milne. In the afternoon the members visited Holyrood Palace, and, in charge of Mr. W. W. Robertson, H.M. Board of Works, had an opportunity of inspecting those parts of the Palace and Chapel closed to the public. Before leaving the Royal apartments, Mr. Ross proposed a vote of thanks to Mr. Sands, her Majesty's Inspector of the Palace, and Mr. Robertson.

PUBLIC IMPROVEMENTS, LEICESTER.—Col. Coke, R.E., Local Government Board Inspector, held an inquiry at the Town Hall, Leicester, on the 22nd ult., with respect to applications by the Town Council for a provisional order sanctioning the compulsory purchase of property for the widening of High-street, Newarke-street, and Hotel-street, and also for the Board's sanction to the borrowing of 73,187*l.* for street improvements, 5,454*l.* for sewage works, 1,025*l.* for public baths, and 1,823*l.* for market purposes. The attendance included Mr. E. G. Mawbey (Borough Surveyor) and Mr. Allen (Assistant Borough Surveyor).

THE DISPUTE IN THE LONDON BUILDING TRADE.

THE letter from Mr. J. A. Hassal, Secretary to the National Association of Master Builders, intimating to the plasterers that a general lock-out will be enforced from March 6, was received by Mr. Deller, the Secretary to the National Association of Operative Plasterers. No reply, however, was communicated, inasmuch as the officials of the men's union were proceeding to carry out the arrangements for a general ballot of the members. This ballot has been taken upon all the questions which the masters have brought into prominence during the course of the present dispute. In the opinion of the union officials a long struggle is imminent, as they say the members of the union are not likely to accede to the demands put forward by the masters. These demands, they assert, have been needlessly forced to the front, and the members of the association would, by complying with them, be sacrificing their trade-union principles. Masters and men, they say, have worked well together hitherto under the present arrangements, and now that the union has given up its refusal to work with non-union foremen, they see no reason for a lock-out and no cause for complaint. There are now nearly 12,500 members of the Plasterers' Union, over 3,500 being in London, and the funds amount to over 20,000*l.* The plasterers believe that the lock-out, if carried into effect, will not deprive the whole of their members of work, as many of the firms employ only trade-union labour, and have so much work on hand that they will not carry out the resolution of the Masters' Association.

The Secretary of the Plasterers' Society stated on the 23rd ult. that the society desired to make one point clear. That was shown in the following letter, which had been addressed to Mr. Hassal, in reply to the communication announcing a lock-out of the plasterers throughout the kingdom:—"Dear Sir,—I beg to acknowledge yours of yesterday's date, but as there are no references to our proposal to meet your association to discuss the points at issue, I would thank you to say clearly whether your association declines to discuss the question, and also to say if it is your intention to ignore the signed agreements with our provincial branches which stipulates for three or six months' notice, as the case may be, for any alteration to such rules, as we contend your demand really meant a revision of such signed agreement.—M. DELLER."

Members of the Plasterers' Union have been instructed not to work overtime pending the settlement of the dispute.

The Master Builders' Association have issued a manifesto, setting out the points in dispute, and the following circular has been posted to all the members:—

"National Association of Master Builders of Great Britain and Ireland, South Crescent-chambers, 6, Lord-street, Liverpool.—Dear Sir,—You have doubtless anticipated the information contained in the enclosed manifesto. The National Association of Master Builders of Great Britain and Ireland relies upon you to pay off all the members of the National Association of Operative Plasterers that may be in your employment on March 4. If you find any insuperable difficulty in distinguishing between union and non-union plasterers, please send letter to that effect.

It is scarcely necessary for me to remind you that the duration of this contest will be determined entirely by the amount of loyalty amongst employers, and I rely upon you not to permit the employment of any member of the National Association of Operative Plasterers on works under your control by any other person, for any such action would only prolong the struggle.

You will be kept informed, as far as possible, of the course of events; but in the meantime let me invite you to place no reliance upon any information that may appear in the newspapers or elsewhere until it is officially confirmed.

WILLIAM HOLDSWORTH, President,
National Association of Master Builders."

Accompanying the letter is a form to be filled in by each employer, stating the number of members of the National Association of Plasterers discharged, and the number of non-union plasterers retained at work.

Mr. Deller received a letter from Mr. Hassall stating that the union's letter, offering to submit the matters in dispute to a conference, would be considered at a meeting of the Standing Committee of the Association, to be held in Liverpool.

The result of the ballot of the members of the Plasterers' Union was to have been announced on Friday. It was generally known on Thursday, however, that the vote of the men is almost unanimous in determining to resist the employers' demands. A general lock-out may therefore be expected on Monday.

We have been shown some quotations from the Official Reports of the Plasterers' Union which throw a striking light on their replies to some of the charges made by the Association of Master Builders. In regard to the limitation of apprentices, the N.A.O.P. asserted that "this was a local question, each district making its own arrangements"; but their own reports showed that all local working rules have to be sent up to the Central Executive for approval; and the by-laws of the London Rules include a definite limitation of the number of improvers. In reference to Clause 5, "That applicants when a vacancy occurs shall not be registered after sixteen years of age," the following is significant:—

Extract from January Report.—"They also requested to know what action they were to take as regards the membership of W. Hawkins, jun., there being some doubts as to his age, and was accepted upon the condition that his birth certificate was satisfactory, which, up to now, had not been produced . . . The General Secretary was instructed to publish a notice blocking his card pending the production of birth certificate."

The master of the apprentice has apparently nothing to do with the matter!

The N.A.O.P. profess that they have "no official knowledge" of any arrangements for boycotting certain firms. The following quotations are given from their own reports:—

Extract from January Report.—"Burton-on-Trent asked if Trollope & Son gave up the job at Lord

Burton's could a local employer take the job? Reply sent: not unless the whole of the firm's men and plant were removed from the job.

Burton-on-Trent.—A request was also made to know if a local firm of plasterers would be allowed to tender for a further extension to Lord Burton's hall under a local builder. —— moved and —— seconded, 'That, providing a guarantee be given that the work undertaken is distinct and apart from any contract undertaken by the firm of Trollope & Sons, this Council will raise no objection to our members working upon such contract.—Confirmed.'

The following extract is from the Quarterly Report:—

"Members are requested not to accept employment from the firm of Harper, builder, Highgate, pending information from the district office; the firm are also building in the neighbourhood of Richmond.

Foalks, builder, in this district, is also blacked, employing Church.

When a piecework master plasterer is stopped upon any public job, no foreman working for him shall be entitled to act as foreman upon the said job for the builder.

Members must not accept employment from the firm of Mr. James, builder, Beckenham, who employs bricklayers to do plastering."

In regard to the claims made by the N.A.O.P. that they, and not the employers, are to be the judges in regard to the class of operatives to be employed on any particular job, the following specimen seems almost incredible:—

"*Burton-on-Trent.*—This branch forwarded correspondence relating to a bricklayer doing the cementing to a soft-water cistern, which they demand shall be hacked off and replastered by a plasterer, the firm giving a guarantee that it shall not occur again."

We have more matter of the same kind before us; but the above is sufficient to indicate the spirit of arrogance in which the Association of Plasterers are acting, and the absolute insincerity of their replies to the Association of Master Builders.

The reflection naturally suggested is—cannot we manage to do without plastering, and adopt other methods of finishing interiors?

THE CENTRAL ASSOCIATION OF MASTER BUILDERS OF LONDON.

THE annual general meeting of the Central Association of Master Builders of London was held on the 23rd ult. at St. Martin's Town Hall, Charing Cross, Mr. Benjamin I. Greenwood, President, in the chair.

The annual report and the audited accounts were read and adopted.

The Council, in submitting their twenty-seventh annual report, refer to the briskness of trade, which is threatened only by the aggressive policy of the trade unions. Seven years ago, a new code of rules was adopted for the purpose of decentralising the administration of the Association, by the formation of district councils. This scheme, though excellent in theory, had proved to be unsatisfactory in practice, and the Council have, therefore, prepared a new code of rules, re-establishing one central executive council only, and providing that such council, and other officers of the Association, shall be elected yearly by the vote of the members of the Association at each annual general meeting. The new rules provide for the maximum subscription being raised from fifteen guineas to thirty guineas, and they also contain several minor alterations. The report proceeds:—

"The year has been characterised by a prevalence of paltry and petty strikes against individual firms of builders. The definite agreement made with the trade unions to submit all disputes for consideration at a conference between employers and employed prior to any strike taking place has been persistently ignored by the workmen. In many instances the trade union officials have repudiated the action of their members, over whom they profess to have no control, although it is to be observed that their control over their members seems to be unlimited when they have a desire to exercise it. Some of these difficulties have arisen in consequence of disputes between different trades as to which trade should do a certain class of work. Time was when the man who paid the wages decided what work should be done for the wages he paid, but this right is altogether ignored by the trade unions, who seem to consider that the employer has no voice in the matter, and, in the event of his refusal to endorse the particular views of any trade union, he is promptly struck against by the offended union. . .

One of the most serious matters for the consideration of the trade is the great increase in the cost of building, in consequence of the great decrease in the amount of work done by the workmen. Although wages have risen, the amount of work done for such wages has rapidly diminished, in fact, there seems to be a systematic determination, more particularly in some trades, that no workman shall do more than about half the amount of work that he is capable of doing, nor permit any other workman to do more. So long as a workman's remuneration is entirely independent of the amount of work he does (and a uniform rate of wages insisted upon), there is, apparently, no prospect of preventing this state of things from developing even to a greater degree. On the other hand, if a workman's wages were dependent upon his industry and exertion, there would be an immediate revolution in the cost of building operations. The present system of almost universal day-work puts a premium upon laziness and inefficiency, and effectually strikes at all enterprise, energy, and effort. It is reducing the British workman to a very low level, and developing a system of chronic dishonesty, which loses its odium from the fact that it has become general."

The report then deals with the present dispute with the plasterers, and includes the statement as to the various objectionable practices which the masters demand shall be discontinued, and which we have already printed. It appears that at the recent meeting of the masters in London, at St. Martin's Town Hall, when a substantial strike fund was contributed, the following resolutions were submitted, and received the unanimous support of the meeting:—

1. "That this representative meeting of master builders and other employers of plasterers in London entirely approves the circular of January 10 (1899) issued by the National Association of Master Builders.

"And this meeting further pledges itself, individually and collectively, to give loyal and energetic support to the policy therein set forth, and recommends that it should be carried into effect at the earliest possible moment."

2. "That in the event of a lock-out, contractors will not employ any members of the National Association of Operative Plasterers, nor permit them to be employed by sub-contractors or any other persons on works under the control of such contractors.

"And in the event of legal proceedings being taken against any member of the Central Association of Master Builders of London, by any sub-contractor for breach of contract on these grounds, the Central Association of Master Builders of London shall indemnify such member against the cost of such legal proceedings."

"The officials of the National Association of Operative Plasterers are," the report proceeds, "evidently relying upon their expressed opinion that the members of the building trade are too much occupied in seeking their own individual interests to enable them to jointly resist any aggression on the part of the Trade Unions with any prospect of success. The National Association of Operative Plasterers has, however, exasperated the whole of the building trade throughout the kingdom to such a degree that there has probably never before been such a unanimous determination to maintain, at all costs, freedom of management and freedom of employment, and there is every reason to rely with confidence on the loyal and energetic co-operation of the trade throughout the country. . . . .

The Association has become affiliated to the south-eastern centre of the National Association of Master Builders. During the past year the process of federating the building trades' employers throughout the kingdom has been rapidly advanced. . . . . The Council wish to call the attention of members to the desirability of forming a register of foremen and clerks seeking re-engagement with a good reference from their recent employers. If all members, who are dispensing with the services of such men, will acquaint the secretary of the Association, they would not only be serving the interests of those who thus leave their employment, but, at the same time, assist other members of the Association who may be seeking such services. The Council desire to impress upon all members of the Association the duty that rests upon them to secure apprentices to the various trades which they practise. Nothing is more serious in the outlook of the building trade than the increasing scarcity of good mechanics. It is an utter fallacy to suppose that technical education will form any sufficient substitute for apprenticeship, and whilst employers refuse to be troubled with apprentices they are creating for themselves and their successors difficulty and trouble in the conduct of their business which it is impossible to adequately estimate. Whilst it is true that the trade unions endeavour to unduly limit the number of apprentices, there is no doubt that some master builders do not even avail themselves of apprentices to anything like the extent to which trade unions assent. Printed indentures of apprenticeship are issued by the National Association of Master Builders, and can be procured on application. It appears to be necessary that members should be cautioned against sacrificing their interests by signing building contracts that are not drawn upon an equitable basis. Amongst other items an adequate extension of time, in event of a strike or lock-out, is essential, and also a proper arbitration clause in event of dispute. Every contractor is entitled to terms of contract similar to those contained in the Form of Contract issued by the Institute of Builders, and the Council recommends that each member should make himself familiar with this Form of Contract for his own protection and guidance, as the carelessness that is frequently exhibited in these matters is most reprehensible. The result of the legal decision in the case of Lyons *versus* Wilkins has established the fact that attempting to stop the conduct of any man's business by means of picketing is illegal, and this decision should save contractors from much annoyance during labour disputes. The Council regrets to report that during the past year Mr. R. S. Henshaw has retired from the office of Secretary of the Association, in consequence of his duties in connexion with the Builders' Accident Insurance Company requiring all his time and attention. Mr. Thomas Costigan has been appointed to the vacancy. . . . ."

Mr. T. Gregory was then elected President Messrs. C. Wall and H. H. Bartlett were elected vice-Presidents, and Mr. H. W. Horner was elected Treasurer.

Other business having been transacted, the meeting terminated.

BUILDERS' CLERKS' BENEVOLENT INSTITUTION:

ANNUAL GENERAL MEETING.

ON the 28th ult. the annual general meeting of this Institution was held.

Mr. W. H. Parker, in vacating the chair of the ordinary monthly meeting of committee, expressed regret at the unavoidable absence of the outgoing President, Mr. R. C. Foster, and introduced the incoming President, Mr. Alfred F. Randall.

Mr. Randall said the report showed the past year to have been a record one, and he congratulated the committee on such a successful period.

The report and balance-sheets as read were adopted.

The report showed an income for the year of £888 14s. 9d.—the donations and subscriptions announced at the annual dinner amounting to £519 9s.; also that there were twenty recipients of the annual pension, two children in the Orphan Working School, and a vacancy for a third. The committee are prepared to receive applications for a builders' clerk's orphan as a candidate.

Correspondence.

To the Editor of THE BUILDER.

BRICKS FOR BREWERY FLOORS.

SIR,—I am about to take up and relay the floors of racking rooms in a brewery, and contemplate using blue Staffordshire bricks laid on edge in cement, on cement concrete.

Will any of your readers who have had experience in brewery work tell me if this will make a good floor; or will the acid in the liquor constantly flowing over it "kill" the cement?

DOUBTFUL.

BOOKS RECEIVED.

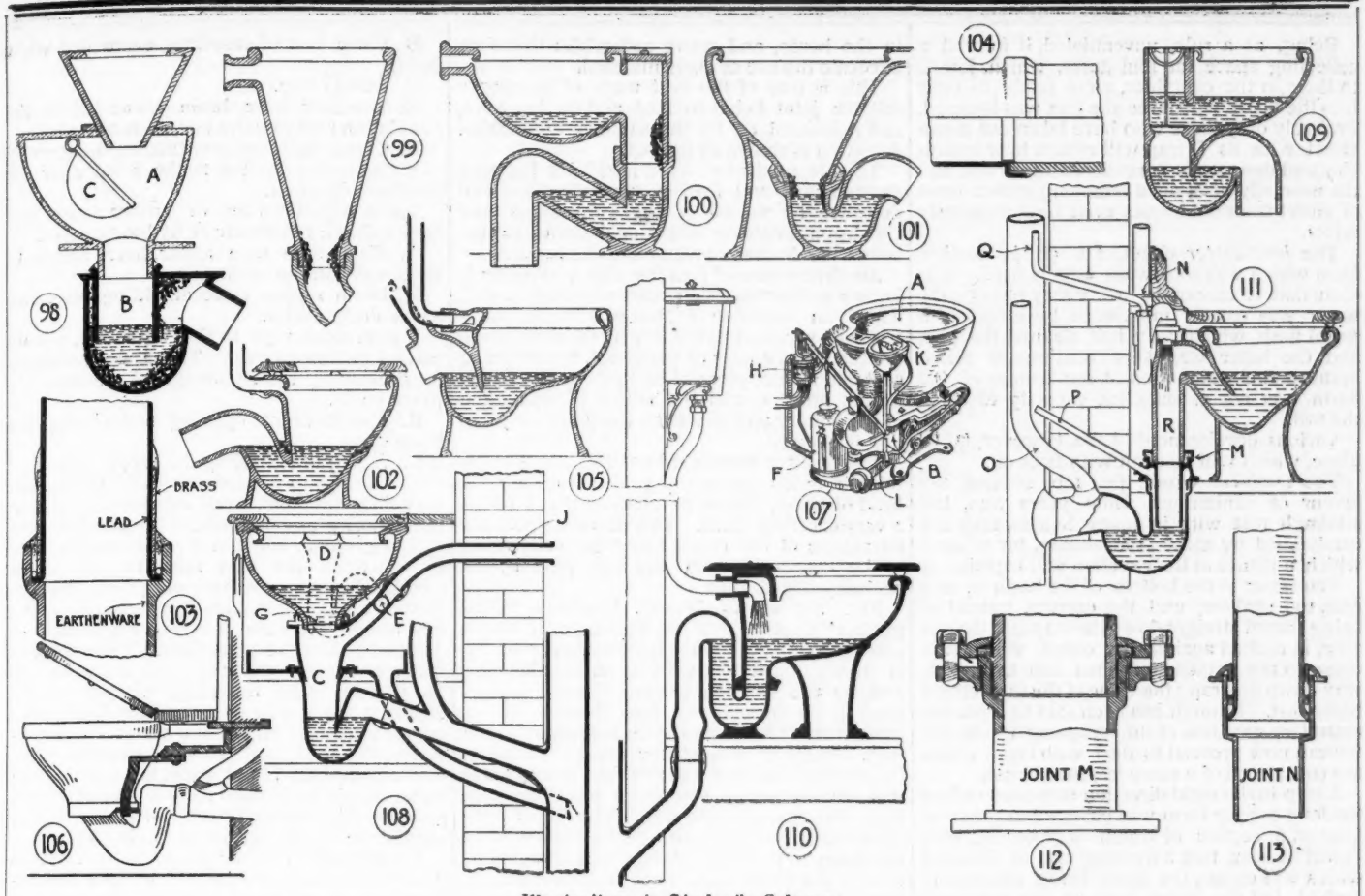
WESTMINSTER ABBEY, HISTORICALLY DESCRIBED. By H. J. Feasey. With an account of the Abbey Buildings, by J. T. Micklethwaite, architect to the Dean and Chapter. (Geo. Bell & Sons.)

DICTIONARY OF ELECTRICAL ENGINEERING AND CHEMISTRY. By Paul Heyne. (Grevel & Co.)

THE LONDON WATER SUPPLY. By Arthur Shadwell, M.A. (Longmans, Green & Co.)

THE WALLS, GATES, AND AQUEDUCTS OF ROME. By Thomas Hodgkin, D.C.L. (John Murray.)

THE PEABODY FUND.—In the thirty-fourth annual report of this fund it is stated that the lease of a small site—part of the Stamford-street Estate—having recently fallen in, the Trustees are erecting on it two blocks of buildings containing thirty-six rooms each, which are expected to be ready for occupation by the end of the year. No other new building is mentioned. At the close of the year the number of existing rooms provided by the Trust was 11,367, besides bath-rooms, laundries, and lavatories. These rooms comprise 5,121 separate dwellings; 100 of four rooms each, 1,767 of three rooms, 2,412 of two rooms, and 842 of one room each. The average rent obtained from each room has been 2s. 2d. a week.



Illustrations to Student's Column.

The Student's Column.

ARCHITECTURAL HYGIENE.

IX.—SANITARY FITTINGS.

HAVING in our last article referred to drain ventilation and siphonage and some of the more usual traps in use, the way has thus been prepared for the discussion of the various sanitary fittings which are used in the house and the general treatment of such fittings.

This section may be conveniently tabulated into the following sections :—

1. *Preliminary Remarks.*
2. *The Various Types of Water-closet Pans, &c.*
3. *Flushing Cisterns and Water-waste Preventers.*
4. *Soil-Pipes and their Ventilation.*
5. *Baths and their Wastes.*
6. *Lavatories and their Wastes.*
7. *Urinals.*
8. *Sinks and their Wastes.*

1. *Preliminary Remarks.*—Sanitary fittings of all kinds should, where possible, be fixed against an external wall, so that the apartment in which they are placed may be capable of thorough ventilation, and also that the fittings themselves and their wastes may be easily overhauled and repaired in case of necessity, so avoiding the danger inherent with internal soil-pipes and the connexion of the house air with the drainage system.

The planning of water-closets in relation to the other parts of a house has been already dealt with in a former article ; but we may emphasise the necessity for making the walls of rooms in which sanitary fittings are placed of non-porous materials. For instance, the floors of bath-rooms, lavatories, water-closets, are best made of tiles, terrazzo paving, or other non-absorptive materials. The walls may be either of glazed tiles, from floor to ceiling, or merely as a dado with the upper part plastered and painted or distempered. A method often employed is to have flooring laid to a fall towards the outer wall, so that the floor can be scrubbed down and the water led by a small waste-pipe into a rain-water head. In America, where the floors and walls of bath-rooms and lavatories are nearly always tiled, the evil effects of overflows to the fixtures are abolished, the overflowing water falling on to the floor and running off by the pipe mentioned.

Every apartment should be well lighted, and with the whole window constructed so as to open, and should, where possible, be disconnected by a ventilating lobby from the house. Abundant light is an enemy to dirt of all kinds. Where there is light there is, as a rule, cleanliness, and this brings us to an important point, and that is the casing of fittings. One of the greatest advances in modern sanitation has been the tendency to abolish what are known as "casings," that is, the wooden enclosures or framings which were formerly considered necessary as an envelope to hide the actual water-closet pan and bath, &c.

In a healthy dwelling casings should be avoided, as they simply harbour dirt and vermin, and answer no useful purpose whatever. One should be able to see all round a sanitary fitting in order to ensure its cleanliness, and unless one can do so it can scarcely remain sanitary.

In the more recent examples of superior plumbing this is now exemplified by the use of pedestal closets and what are called "Roman" baths, *i.e.*, rolled edge baths without enclosures. Lavatory basins are often carried on nickel-plated brass brackets, all the pipes being in sight.

To the student in London a visit to the Parkes Museum in Margaret-street, and to the Architectural Museum, King's College, will be of the greatest assistance, because he will see there models of appliances of every kind.

2. *The Various Types of Water-closet Pans, &c.*—It goes without saying that the water-closet is the most important of sanitary fittings, and is that to which the attention of reforming sanitarians has been earnestly directed. A water-closet fitting consists of a basin and a trap, and its efficiency depends on the way these are constructed so as to answer certain requirements of cleanliness and suitability.

Before dealing with the various types of basin, let us state briefly what is required in each. The basin, it is evident, should be of such a shape that no part is liable to be soiled by the excreta falling on the sides, and every part should be thoroughly scoured by the flush of water. It should be made of glazed stoneware, a perfectly impermeable material, preferably finished white, and so formed that it retains a sufficient depth of water from the after-flush to receive the excreta, and so prevent the fouling of the bottom of the basin. This latter point is of importance because it is found that if the fæces are thoroughly coated with water before being discharged into the soil-pipe, there is less likelihood of the fouling of the interior of the pipes.

The apparatus should, if possible, have no working part which can get out of order ; and, lastly, as mentioned previously, should not be enclosed in woodwork, which forms a receptacle for dirt and filth of all kinds.

The water-closet trap should be of a simple self-cleansing form, without angles or other obstructions, fixed above the floor so as to be easily accessible. It should have a minimum water seal of 1½ in. to 2 in., and protected against siphonage (as referred to in the article on "Drain Ventilation") by being ventilated at its outgo.

In dealing with the various forms of closet, we shall observe that the basin and trap are sometimes made of the same piece of earthenware, whereas, in other cases, the trap is made separately of lead or iron. With a separate trap, there is the advantage that in case of damage to a water-closet pan it can be repaired without opening up direct communication with the drains.

We do not propose to take up much room by dealing with insanitary forms of water-closets, but no article would be complete without reference to a few which have been in use in the past, and by looking at the reasons for which they have been discarded, we shall perhaps be better able to understand the sanitary points of the better forms.

Of all insanitary fittings the old *pan-closet* (fig. 98), with iron container (A) and lead D trap (B), was undoubtedly one of the worst. A glance at the illustration will show that in no respect does it fulfil the requirements as set forth at the beginning of this chapter. It takes its name from the hinged pan (C), which swings backwards and forwards by means of the closet handle. As will be seen, this pan requires a space to swing in ; this was known as the "container," which quite acted up to its name, as it formed a receptacle for the excreta which made it neither more nor less than a small cesspit. Even when the closet was flushed the water could not succeed in reaching a large part of the container, which, therefore, was never cleansed, but became fouler and fouler from the splashings of the pan; and the gases, of course, found their way into the building whenever the pan was let down to clear the closet of excreta. This was in itself bad enough ; but, in addition, the apparatus had attached to it what is known as a D trap, so called from its shape. It will be seen at once that it is a most insanitary form of trap, with large flat surfaces and corners ready to intercept and collect the excreta.

Being, as a rule, unventilated, it formed a collecting space for foul gases, which, joined to those in the container, were ready to pour into the house whenever the pan was lowered. Probably only those who have taken out a pan closet with its D trap will realise how insanitary and dangerous it rendered the house, and the necessity of at once removing such a form of closet from old houses even now constantly arises.

The *long-hopper* closet, fig. 99, is another form which was somewhat largely used. It is seen that it cannot be a sanitary fitting; the water was usually introduced by means of a spiral flush, which only half cleaned the pan, and the latter was kept continually soiled because the water area at the bottom of the basin was not of sufficient capacity to catch the soil.

Various developments have, however, taken place, which will be dealt with later on.

The *wash-out* closet, fig. 100, secured the favour of sanitarians some years ago, but although met with in many houses, they are condemned by most as insanitary, for reasons which a glance at their section will explain.

The water at the bottom of the basin is, as a rule, too shallow, and the excreta, instead of being forced straight down the trap into the soil pipe, is dashed against the outgo, which is in consequence fouled, and then has to find its way down the trap; the value of the momentum being lost. Enough has been said to show the insanitary qualities of the foregoing types, and we can now proceed to deal with types which are considered of a more improved kind.

A step in the right direction was made when the long hopper form was changed to the short hopper, a section of which is given (fig. 101). It will be seen that a flushing rim is obtained which will ensure the basin being thoroughly flushed, but the water area at the bottom is only about 4 in. in diameter, and the basin would practically be fouled every time it is used by the excreta falling on the sides.

This brings us to the simplest and probably the best form of closet for ordinary purposes, which is known as the *wash-down*, and a form of which is now ordinarily used for general purposes (see fig. 102).

It is an improvement on the short hopper form. It can be either made in one piece, with the trap attached, or in two pieces, the trap being separate; the latter being best, because the pan can be repaired without opening up communication with the drain.

Among the many advantages which this closet possesses are its simplicity and cheapness, which are most important factors. It is usually made of a pedestal form, spreading sufficiently to carry the weight of the person using it. It requires no "mahogany enclosure," but is provided with a lift-up seat, hinged so as to fall against the wall, thus enabling the basin to be used as a urinal. The outside may be ornamented in low relief in colours or kept perfectly plain, so that any speck of dirt can be at once removed. It will be observed that the water area is as large as possible, which prevents the fouling of the basin; and it is also deep enough to submerge the fæces, and thus prevents the apartment being filled with noxious odours. The former is an important point, as if the fæces fall on the dry side of the basin, they adhere so that two or three flushes are sometimes necessary to remove them. The flushing rim is of sufficient size and form to thoroughly scour the inside of basin. The trap in this case is a P trap, with a water seal of 2 in., and the outgo is so arranged that the joint is under water, so that in the event of any defect arising it is at once made apparent.

The joint between the lead soil pipe and the earthenware trap is generally the weakest part of this form of water-closet, and special care must be taken to render this perfectly air-tight. The London County Council have issued regulations on this joint, and the vestries also insist on its being made as follows: In connecting a lead pipe to earthenware a socket is formed on the lead pipe by means of a plumber's "turning pin." The end of a brass collar or ferrule fits into this. Tallow is then rubbed over the parts on which solder is to be placed, and then molten solder is poured around the joint and "wiped" into shape by help of a cloth. The brass ferrule is then jointed to the earthenware by means of a ring of gaskin (hemp) and neat cement is then run in and wiped round. This fills in the grooves and makes a thoroughly waterproof and air-tight joint. Pathogrine germs are prone to linger in the hemp, and many authorities therefore advocate the use of other material.

This is one of the best ways of forming a reliable joint between lead and earthenware, and is insisted on by the sanitary authorities. A section is shown in fig. 103.

The old method of a red lead joint between earthenware and lead is generally rendered defective by means of the contraction and expansion, allowing direct communication between the drainage system and the house.

Another means of forming this connexion is known as the "metallo-ceramic" joint (fig. 104). This is an invention of Messrs. Doulton, and it has been received favourably by the authorities. On the pottery only of the closet, before being sent out, a short piece of lead pipe is fused by a patent process, and the entire incorporation of the pottery and metal at the point of junction is effected.

The result is considered perfect, and as every joint is tested up to the pressure of a 45-ft. head of water, it must be admitted that it forms a very excellent joint. This also possesses the advantage of the closet being perfectly ready to be connected with the soil pipe by an ordinary wiped joint.

Fig. 105 shows Messrs. Doulton's "Simplicitas" closet, which has found much favour among architects. An anti-siphonage pipe (S) is shown and it is usually 2 in. in diameter, and by the London County Council regulations it is placed not less than 3 in. or more than 12 in. from the highest point of the trap. There is a tendency among manufacturers not to follow out this rule, but to place this anti-siphonage connexion less than 3 in. from the crown of the trap. The use of anti-siphonage pipes has been already dealt with as necessary to prevent siphonic action, and thus destroy the water seal. They are also useful in ventilating the upper part of the trap, thus preventing foul air from pressing against the water seal. The illustration shows the flush pipe, which is connected with a siphon-flushing cistern or water-waste preventer. It is usually made of $1\frac{1}{2}$ in. internal diameter and connected with the flushing rim by means of an india-rubber cone.

We have dealt at some length with this perfected form of wash-down because it is now generally regarded for ordinary purposes as one of the more satisfactory.

An improvement on the ordinary wash-down is the "Bracket" closet by Messrs. Dent & Hellyer (fig. 106). This closet is kept off the floor, so that the latter can be properly washed, and there is no chance of dirt and dust collecting. It has been used in many hospitals. The water surface to receive the motion is about 8 in. by 5 in.; an improvement on some of the earlier firms, but it is not so large as Doulton's "Simplicitas," whose water area measures $10\frac{1}{2}$ in. by $6\frac{3}{4}$ in.

We have now to deal with an important type of closet which is still preferred by some, and which if made in the best manner does possess some advantages even over the improved forms of the wash-down type. We refer to what is known as the *valve closet*. By reference to the illustrations, figs. 107 and 108, an idea will be obtained of the appearance of a valve closet and of its more complicated appearance in comparison with the simpler forms we have been discussing.

The illustrations (a view and section) represent Mr. Hellyer's "Optimus" valve closet, and the various parts being lettered, will be readily understood. The apparatus consists of three parts—the basin, the valve-box, and the lead anti-D trap placed underneath.

The advantages which a closet of this type possesses over others may be briefly stated. On reference to the section it will be observed that a large water area (the contents equalling about a gallon) is available to catch the fæces, to thoroughly envelop them, and pass them through the pipes without adhering to the latter. The closet also possesses a double water seal and a closely-fitting valve, so that in the case of the closet remaining unused for some time, additional security is obtained; besides which the foul air in the soil pipe presses against the lower trap, saturates the water in it with foul gases, which are then given off, and escape by means of the ventilator to the valve-box. This is another advantage over a single trap. To these we may add that there is usually less noise in emptying a valve closet than a wash-down type. In the section and view the parts are lettered as follows:—

A. Earthenware basin with flushing rim.

B. Valve box of cast-iron, enamelled white inside.

C. Anti-D trap.

D. Overflow from basin connected to the ventilation arm of valve box, as shown at E.

E. Copper bellows for regulating the quantity of water to be admitted to the basin after the handle is dropped.

These regulators are of various forms and have either a pneumatic or hydraulic valve.

G. Flap valve with indiarubber flange to keep water in the basin.

H. Brass supply valve admitting the water to the flushing rim.

J. 2-in. vent pipe to the valve box, simply carried to the outer air. This is also necessary for preventing the siphonage of the overflow to the basin.

K. The lever for opening and closing the basin valve.

L. Weight for shutting the supply valve.

The fittings to a good valve closet will, with very little attention, work satisfactorily, but in the majority of cases where no such attention can be given to them, it is, perhaps, advisable to substitute the best form of wash-down closet. Again, a wooden casing is usually considered necessary to hide the mechanism, and this usually succeeds in hiding a good deal of dirt and filth at the same time. The supply of water is not a regular one, but dependent on the person using the plug, whereas in the ordinary wash down one pull of the handle empties the contents of the water waste preventer into the basin. In valve closets a water waste preventer is not used, but the flushing water should be derived from a special cistern, properly disconnected from the cistern which supplies the water service of the house.

An illustration of a "plug" valve closet is given in fig. 109, which will explain its construction, in which it will be observed that there is no valve chamber. It is, however, seldom used and can scarcely be recommended.

Siphonic Closets.—These are based on principles that have found favour in recent years, and which have been used with success, although it is doubtful whether they have been sufficiently long before the profession to constitute a lasting trial. The one shown in the illustration by Messrs. Shank (fig. 110) gives one a fair idea of the principles on which it is designed. The points to be noticed are its deep seal of 8 in., the large water surface of $13\frac{1}{2}$ in. by $11\frac{1}{4}$ ins., its powerful suction properties, and there being no joint on the drain side of the trap. It is said only to require a two-gallon flush.

Messrs. Jennings & Morley's Siphonic discharge closet, shown in fig. 111, has a surface area of 12 in. by 10 in., and the trap has a 3-in seal. The illustration shows the closet fixed over a 4-in. lead trap. The joints M and N must be air-tight, and are formed as shown in figs. 112 and 113. O shows the usual 2-in. anti-siphonage pipe. P is a puff pipe, taken through the wall and left with an open end. The in-coming water expels the air through this pipe and starts the siphonic action. Pipe Q admits air to the siphonic leg R, and prevents the siphonage of the basin when slops are emptied into it. It should be noted that the service-pipe from the cistern has two connexions to the closet, one leading into the basin, and the other into the top of the long leg of the siphon-pipe R.

The siphonic closets have been used largely in America, and they seem to be gaining favour in England at the present time for public purposes.

TRADE CATALOGUES.

MESSRS. NICHOLLS & CLARKE (London) send us their catalogue of sanitary goods, &c. It is a well-bound and well-illustrated quarto volume of 408 pages, the paper highly glazed and of good quality, and the type excellent. Many of the fittings described and illustrated are the specialties of Messrs. Nicholls & Clarke, but, as nearly all the foremost manufacturers of sanitary goods are also represented, the catalogue is a compendium which cannot fail to be of great service to architects, builders, and sanitary engineers. We are glad to find that pan-closets and D traps are conspicuous by their absence, but bell-traps of various kinds unfortunately still find a place. So long as there is a demand for such fittings, merchants will continue to illustrate them, and the catalogue before us must be taken as evidence that bell-traps are still

used, although we cannot think that architects ever specify them. Among the water-closets we notice Messrs. Nicholls & Clarke's "Parja" pedestal closet, which has the advantage of a lead trap, but the area of the water-surface—an important point—is neither stated nor shown. Only one example of siphonic closets is given, but other varieties are very fully illustrated, and about sixteen different kinds of water-closet cisterns are given, including the "Monarch" and "Waterwitch"; we are glad to see that most of the cisterns are made in the 3-gallon size as well as in the 2 and 2½ gallon. Cisterns for other purposes, cylinders, boilers, safety-valves, taps, pumps, rams, and other details of domestic water-supply are among the contents of the volume, as well as sinks for kitchens, pantries, and housemaids' closets, but the untrapped glazed-ware waste-pipe cannot be recommended. Gas-fittings and meters, hydrants and hose, beer-engines and bar-fittings, pipes of lead and of cast and wrought iron, tools, paints, and glass are all illustrated and quoted, although not so fully as the sanitary goods, such as water-closets, baths, lavatories, drain-testing appliances, and sinks. Useful information is given about pumps, and forty pages are devoted to the Model By-laws of the Local Government Board, the By-laws of the London County Council, and the regulations of all the metropolitan and nineteen provincial water companies. Architects and men engaged in every branch of the building trade cannot fail to find in this catalogue much of interest and of service.

Messrs. A. Ransome & Co. send us their new catalogue of wood-working machinery and appliances, which contains between forty and fifty new illustrations. Among these are the vertical band-saw machine (page 34) for medium-sized logs, intended to meet the requirements of those who have not sufficient work to warrant the adoption of the more expensive machines; the horizontal log band-saw machine, (page 36) which can be controlled by one man; the semi-portable log frames (page 52), intended for positions where the presence of water immediately below the surface precludes the formation of a vault under the mill floor; the log band-saw with wooden framing (page 54) for breaking down very large logs—Jarrah and Karri trees up to 7 ft. diameter; the reciprocating cross-cut saws for cutting logs of any size; the combined self-acting and roller-feed saw benches (page 74); band-saw machines with self-acting cant tables (page 89); and the special high-speed flooring and match-boarding machine, (page 96) designed for preparing flooring and match-boarding at the highest attainable rates of speed. The following is part of the description of this latter machine:—

"The feeding arrangement is very powerful, consisting of four pairs of feed rollers of large diameter, all of which are driven, thus ensuring the boards being fed continuously past the cutters without any slip; and the pressure apparatus is so arranged as to press equally over the entire width of the piece when passing over the fixed knives and revolving cutter-blocks. The whole of the top feeding rollers can be raised or lowered simultaneously, to suit for boards of different thicknesses, by turning a single powerful screw placed at the extreme end of the machine. The board is held firmly to the bed of the machine, and kept close to the fence, as it passes along, by means of a series of weighted pressures, which effectually prevent any vibration in the board, and thus ensure clean work.

In passing through the machine, the board first comes in contact with the bottom revolving cutter, which removes any irregularities in the surface of the board before it arrives at the fixed knives. This bottom cutter is fixed in a cast-iron drawer, which can be readily drawn out clear of the main framing of the machine when it is required to sharpen, change, or adjust the cutters. The board next passes over the fixed knives, two of which are fixed in a cast-iron drawer, which can be instantly removed and replaced by another when the cutters become dull. The board next passes to the side cutters, which are specially constructed to produce true and smooth work with a high rate of feed without breaking the edges. The board finally passes under the top revolving cutter, by which it is reduced to a perfectly uniform thickness."

The catalogue is a very large one, in which every machine is illustrated and fully described.

Messrs. W. H. Willcox & Co. send us illustration and description of their semi-rotary wing pump. This consists of a perfectly cylindrical casing in which a strong brass wing, provided with valves, oscillates. The casing is closed by a lid which is fastened by four, six, or eight bolts, according to the size of the pump, and which, when necessary, can be easily removed without the pump having to be taken to pieces. On the outside the spindle is furnished with a lever which can be operated either by hand or by power. The pump acts both as a lift and as a force pump, and with the use of a foot-valve it sucks up to a height of 25 ft. These pumps have lugs to fix against a plank or wall. The same makers also send a catalogue of various other pumps made by them.

Messrs. Jas. Hill & Co. send us their catalogue of fan-light openers of all kinds, metal casements, and ventilators, including their patent noiseless silk flap exhaust ventilators; and showing gearing for fixing and working fanlights in every position.

Messrs. Shand, Mason, & Co. send us "an occasional circular" of their various forms of fire-engine and fire extinguishing apparatus.

Messrs. S. & E. Collier send a catalogue with illustrations of their roofing and wall tiles, finials, and other ornaments and chimney-pots; the latter are very good and suitable in design, a certain degree of characteristic finish being given to them without attempting anything pretentious in the way of ornament.

Messrs. G. B. Kent & Sons send us a catalogue of their painting brushes of all kinds for house painters' work; and Mr. C. S. Bailey (Bristol) a catalogue of his stencil plates and compartments of adjustable stencils.

We have received from Messrs. Williamson & Joseph, of Northampton Works, Canonbury, London, a copy of their new catalogue of electric fittings and goods used in electric lighting and other applications of electricity. In the design of some of the fittings very considerable originality is displayed, and this catalogue will be a useful one for engineers and architects to file away for reference. We were specially struck by the design of the switch-boards and the distributing fuse-boards. We were glad to see that a china division fillet and a 2-in. break have been introduced into the latter when intended for high voltage circuits. It is interesting also to note a tendency towards greater simplicity in the parts of electric fittings, no screw or fuse that could possibly be done without being anywhere in evidence. An excellent example of this is shown in their new lamp-holder suitable for high voltage. The prices of the various articles are moderate.

OBITUARY.

MR. THOMAS ROWE.—The death is announced at Sydney of Mr. Thomas Rowe, President of the Sydney Water and Sewerage Board. He was the son of Mr. Richard Rowe, contractor, of Penzance, and was born in 1829. He went to Australia in 1849, and in 1856 began his long career in Sydney as an architect. Mr. Rowe was the founder of the Institute of Architects of New South Wales, and a Fellow of the Royal Institute of British Architects. In 1888 he was appointed President of the Metropolitan Water and Sewerage Board. Mr. Rowe held the rank of colonel in the New South Wales military forces.—*Western Morning News.*

GENERAL BUILDING NEWS.

CHURCH, SOUTH TOTTENHAM.—The foundation-stone of the new Church of St. Peter, South Tottenham, was laid recently. The building will have red brick walls, Weldon stone window and door-dressings, bands, &c., and red Dumfries stone for the arcade pillars; the roofs of pitch-pine timber, covered with tiles. The floors will be laid with wood blocks under the seats, and with marble mosaic in the chancel and porches. The church will consist of nave and aisles, chancel, with a morning chapel on south side, and organ chamber and vestries on north side, and baptistry and narthex at west end. There will be accommodation for 800 persons. The west end will have a bell turret and a large traceried window above the baptistry roof. The architect is Mr. J. S. Alder, of Arundel-street, Strand. The total cost will be about 8,000*l.*

ST. PAUL'S CHURCH, WEST SMETHWICK.—This church, which has been closed for several months whilst a scheme embracing alterations, additions, and repairs has been carried out, was reopened on the 22nd ult. The galleries at the west end and over the south transept have been taken away, and the principal entrance to the church has been arranged under the spire. The space formerly occupied by a staircase to the gallery has been utilised to form a porch. A baptistry has been provided at the west end of the church, and this contains a new font. The whole of the old seats in the nave and south transept have been removed, and the seating and aisles have been rearranged, so that now there are three aisles instead of two, as formerly. A new boarded floor has been fixed under the whole of the seating, the aisles having been laid with red tiles. The heating and lighting arrangements of the edifice have also been altered. The interior of the church has been cleaned and redecorated. The work has been carried out by Mr. H. Harper, builder, of Oldbury, under the superintendence of Mr. F. Gill, architect, of Smethwick.

BAPTIST CHURCH, LURGAN, CO. ARMAGH.—The new edifice erected by the Baptist congregation in Lurgan was opened on the 19th ult. The building is situated on Windsor-avenue. The new church was erected by Messrs. Redmond & M'Cullough, Lurgan, from plans prepared by Mr. W. Redmond. The design is Gothic, and the building is of red brick, relieved with red sandstone. It is 50 ft. long by 30 ft. wide, and is capable of seating 250 persons.

WELSH CONGREGATIONAL CHAPEL, BOOTLE, LIVERPOOL.—The new Welsh Congregational chapel to be erected in Trinity-road, Bootle, has been entrusted to Mr. T. Taliesin Rees, architect, Birkenhead. The design was selected from a number submitted in a limited competition. The building will be erected in red brick and terra-cotta.

SCHOOL-ROOM, MISTLEY, ESSEX.—The new infants' school, annexed to the Norman Schools, at Mistley, was opened recently. The architects were Messrs. Baker & May, and the builder Mr. T. Canham, of Weeley. The building is an extension of the existing schools, which were built at a cost of 4,000*l.*

YORKSHIRE FORESTERS' ORPHANAGE, BRIDLINGTON.—The foundation and memorial stones of an orphanage and convalescent home were laid at Bridlington on the 23rd ult. The building, which will be of red brick, with stone dressings, was designed by Mr. Robert J. Beale, of Westminster, who won the premium in competition; and Mr. Joseph Shepherdson, of Hull and Driffield, has supervised the carrying out of the work. It will occupy a site near the railway-station, and about mid way between the Old Town and the Quay. The internal arrangements provide for sixteen children and thirty adults. Exclusive of site and furnishings, it will cost a little over 2,000*l.*

CONSTITUTIONAL CLUB, HULL.—The foundation-stone of the new Hull Constitutional Club was laid, on the 22nd ult., on the site recently purchased in Carr-lane. The club has been designed by Mr. B. S. Jacobs, and will be in the Renaissance style. It will have an elevation of three stories, and will contain reading, smoking, and billiard rooms, and a large central hall, besides sleeping accommodation for the members.

CLUB, BIRKENHEAD.—The new Liberal Club at Higher Tranmere, Birkenhead, is now in course of erection. The building is of a Renaissance character, and will be of red brick with Brynteg stone dressings. The accommodation will include assembly hall to seat 400, billiard-room for three tables, smoke-room, reading-room, refreshment bar, kitchen, store cellars, lavatories, and cloak-rooms, retiring-rooms, &c. The contract is let to Messrs. John Lee & Son, Bebington, Cheshire, and the work is being carried out from the plans of Mr. T. Taliesin Rees, architect, Birkenhead.

THE NEW INFIRMARY FOR NEWCASTLE.—A print of the instructions and conditions of the competition for the New Infirmary on the Castle Leazes, with a plan of the site, have now been issued to the eighteen architects who have been requested to send in designs. These are to be for a complete infirmary, on the pavilion system, containing 400 beds—180 medical and 220 surgical.

TECHNICAL SCHOOL AND FREE LIBRARY, HYDE, LANCASHIRE.—The new building of the Hyde Technical School and Free Library was opened on the 18th ult. The building, which is in Union-street and near the Corporation baths, and the Mechanic's Institute, has been built at a cost of about 13,000*l.* It has accommodation for 1,000 students. In the basement are rooms for laundry work, cooking, dressmaking, and art modelling. The ground floor has a reading-room, ladies room, lending department of the library, the librarian's room, the secretary's office, committee-room, and the building construction and machine construction departments. On the first floor are the chemical laboratory, the chemical theatre for scientific lectures, the chemical master's room, the physical laboratory, the elementary art room, and the advanced art department and the art master's room. The architects of the building were Messrs. Woodhouse & Willoughby.

PATENT OFFICE (NEW) LIBRARY.—Messrs. Perry & Co., contractors, have begun to clear the ground in the rear of Staple Inn and Southampton-buildings for the erection of the new library block; the plans and designs have been prepared in H.M.'s Office of Works, and it is expected that the new premises will be completed in three years' time.

MUSIC HALL, INVERNESS.—A new hall, to replace the one destroyed by fire, is to be built at a cost of 4,000*l.*, from plans by Messrs. Ross & Macbeth, architects, Inverness.

MUSIC HALL, MIDDLESBROUGH.—The new music hall in Corporation-road, Middlesbrough, will be opened on March 6 next. The new theatre has been built of terra-cotta and red brick. The entrance-hall in Corporation-road is 34 ft. by 19 ft., and 18 ft. in height. Leading out of it to the right and left are broad staircases to the grand circles and the stalls respectively. The auditorium is 60 ft. wide and 63 ft. in depth, the average height of the false

ceiling being 45 ft. Provision is made for 120 orchestra stalls, 120 stalls, and a pit accommodation for 450. The grand circle will hold 150, and in its rear is a saloon, 34 ft. by 27 ft. There are, in all, six private boxes, and the gallery will accommodate 750 persons. The woodwork is decorated in white and gold, and a series of paintings of allegorical subjects surrounds the great central light in the ceiling. The stage dimensions are:—Width, from wall to wall, 70 ft.; average depth, 35 ft.; height, to flies, 25 ft.; height, to grid, 55 ft.; proscenium opening, 30 ft. square. The building was designed by Mr. Ernest Runtz, of London, who has supervised the construction, with the assistance of Mr. W. Duncan and Mr. E. A. Whipham. It is lighted by electricity throughout.

COUNTY POLICE BUILDINGS, BLAENAU FESTINIOG, NORTH WALES.—The contract for the County Police buildings which are now being erected has been let to Mr. P. McLachlan. The building will be erected of local stone, with red sandstone dressings. The design is from the office of Mr. T. Taliesin Rees, and it was selected in open competition.

CHILDREN'S WING, WEST CORNWALL HOSPITAL, REDRUTH.—The Jubilee Children's Wing of the West Cornwall Women's Hospital at Redruth is now complete. The building has been erected from the designs of Mr. Sampson Hill. The children's wing will be served from the women's hospital kitchens, being connected by a covered passage.

TECHNICAL SCHOOL, BOOTLE.—A new technical school is to be erected at Bootle on a site which fronts the Balliol and Pembroke roads. The institute will be erected from the designs of Messrs. Best & Callon, architects, Westminster. The lowest tender received was from Mr. John Corkill, of Liverpool, the amount being 22,064*l.* The front of the building will be of red brick, with buff terra-cotta dressings, and the roofs will be covered with Westmoreland green slates. Straight through from the principal entrance on Balliol-road there will be the examination or lecture-hall, with various class-rooms and offices branching off from corridors on either side. The large hall will accommodate 285 persons, and the class-rooms from thirty to fifty students each. At the back will be shops for the metal workers, carpenters, and plumbers. Two main staircases will communicate with the first floor, the front part of which will be mainly occupied by the Art Department. The elementary art-room will accommodate fifty students, and the modelling and advanced art-rooms about twenty each. On the right hand side will be situate the engineering, drawing, and general class-rooms, each with an accommodation for between thirty and fifty students. The whole of the space on the left hand side will be given up to chemical departments. The masters' rooms will be so situated as to allow of communication with all the class-rooms without going through the corridors.

PEARL ASSURANCE BUILDINGS, SOUTHSEA.—Buildings for the Pearl Assurance Company are being erected at the corner of Commercial-road and Grigg-street, Southsea. The frontage line to Commercial-road has been set back 18 ft. at the Grigg-street corner, and about 10 ft. at the eastern end, thus widening the road to 60 ft. The frontage to Commercial road extends 93 ft., and to Grigg-street 70 ft., the height to the ridge of the roof being 72 ft. The elevation is mainly in Portland stone, relieved by local facing bricks supplied by Mr. Foster, of Stamshaw, and enriched by carved panels, caps, shields, and scrolls, the carving being the work of Mr. Syl Horsman, of London. The pilasters of the frontage to Commercial-road are mainly in polished granite. This portion of the frontage is divided into six bays, and that to Grigg-street into five bays; and every alternate bay, except those at the angle of the building, is broken up with oriel bays, the one over the main entrance being elliptical in shape, with an ornamental and enriched gable with stone pediment and pinnacles, and the other bays will be finished with a stone balustrade and dormers. The angle of the building will be terminated by an ornamental copper-covered dome, constructed of steel, the height being 104 ft. from the road level. The main entrance is through ornamental wrought iron gates. The ground floor will contain four shops and two sets of offices, those at the corner being retained by the company for their own business. There is also to be a temperance hotel at the south-west end of the building, with entrances from Grigg-street and Waltham-street. It, as well as the shops, will be separated from the other portions of the buildings by brick walls and concrete floors. The corridors and lavatories will have a dado of tiles throughout. The whole of the ground floors, the corridors, and staircases are fireproof. The entrance to the offices adjoins the company's offices, the hall being 10 ft. wide. This gives access by concrete staircases to the upper floors. This portion of the building is to be supplied with a passenger lift. There is a basement throughout. The whole of the outside facings to the back elevation are of white glazed bricks. The first, second, and third floors will contain fifteen suites of offices, each to contain not less than two rooms. The attic floor will be partly utilised as stock rooms and partly as the residence of caretakers. The roof, which is to be covered with chocolate Ruabon pressed tiles, is broken up by dormer windows between the gables of the several bays. Part of the roof of the hotel will be covered by an asphalte flat, by Mr. Bradshaw, of Southsea. The building is being erected from the designs of Mr. C. W. Bevis, architect, Southsea; the contractor is Mr. J. H. Corke, Southsea; and Mr. A. J. Lewis is the clerk of works.

THEATRE, ECCLES.—On the 23rd ult. there was an informal opening of the New Lyceum Theatre, Eccles. The building is in the English Renaissance style, and has been erected from the design of Mr. Walter Campbell.

NEW BANKING PREMISES, CITY-ROAD.—The building which has been erected for the London and Westminster Bank, with post office and club premises for the Finsbury Central Club, occupies a commanding position at the junction of City-road and Old-street. The style is Italian. The building is constructed up to the first-floor cornice in red and grey Aberdeen granite and the upper part in red brick with Portland stone piers, caps, and dressings to windows; the doors and sashes in solid oak. The building consists of basement, in which is the rising lift, also strong rooms built in blue bricks and steel banded. The banking room, on the ground floor, has the walls lined with solid Devon marble, with panels from the red Ippel Marble Quarry, Totnes; the skirtings, sills, and mouldings being black Ashburton marble. The twelve piers have alabaster bases and caps, and the enriched ceiling is in fibrous plaster. The whole is fitted with the electric light. The main building has been erected by Messrs. J. Grover & Son, of New North-road. The ceiling was designed by Mr. J. M. Boekbinder, of Camden Town; the marble work is by Messrs. Jenkins & Son, of Torquay; the mosaic floor, in Italian marble, by Messrs. Mainzer, of Berners-street; the oak wood block floor by Messrs. Charteris & Longley, of Crawley; the stone carving by Mr. Seale, of Camberwell, and the granite by Messrs. Whitehead, of Aberdeen. Mr. R. Bennett, of London, is the architect.

SANITARY AND ENGINEERING NEWS.

PUBLIC IMPROVEMENTS, BIRMINGHAM.—Improvements involving the straightening and widening of the River Rea, the construction of the "Queen's Ride" by the side of the park, and street extensions, at Cannon Hill Park, are being carried out by the Birmingham City Council. The scheme includes the extension of Lower Edwardes-street to Edward-road to connect Balsall Heath and the Pershore-road. The contract for straightening and widening the river has been given to Messrs. Thomas Lowe & Sons, Burton-on-Trent.

SEWERAGE SCHEME, POCKLINGTON.—The Main Sewerage and Sewage Disposal Scheme for the town of Pocklington has been completed, and the Local Government Board consent obtained to the loan for carrying out the extra works ordered by the Council, the contractor for which was Mr. Thos. Bell, of Market Weighton, and the engineers, Messrs. D. Balfour & Son, London and Newcastle.

VAUXHALL BRIDGE.—About half the superstructure of Vauxhall Bridge has now disappeared, leaving about 400 ft. of the river uncovered. The rest of the ironwork of the old structure will probably have gone in another six or eight weeks.

MERSEY DOCK IMPROVEMENTS.—The Mersey Docks and Harbour Board have, after two prolonged debates, adopted recommendations of the Works Committee as to carrying out (at an estimated cost of 885,335*l.*) certain of the great works provided for in the Act obtained last year, the borrowing powers under which approximate to five millions. The instalment now to be proceeded with comprises the construction of a new branch of the Huskisson Dock, with double-story flat-roofed sheds (capable of being converted into three or four story sheds if necessary) on the north and south sides, at an estimated cost of 482,782*l.*; the construction of a graving-dock, 1,000 ft. long and 95 ft. entrance, to the south of the above-mentioned branch dock, and to cost 202,813*l.*; and the provision of a new quay on the north side of the Sandor Dock, in connexion with the foregoing works, with a two-story flat-roofed shed, at a cost of 199,738*l.* The Committee also advised some variation in the scheme for the new Queen's graving-dock, 630 ft. long and 80 ft. wide at entrance. At first it was proposed that the 1,000 ft. graving-dock should be capable of being divided into two, but this idea was abandoned. The controversy at the Board has been almost entirely devoted to the sheds. While the Committee advised two-story flat-roofed sheds, on the top of which cranes could work, some members advocated three stories and others four stories. The scheme as adopted will give thirty-two acres of shed space, and will be capable of accommodating 160,000 bales of cotton or 160,000 tons of grain at one time.

SEWERAGE SCHEME, BRADWELL, BUCKS.—A Local Government Board inquiry was held recently at Bradwell, near Wolverton, by Mr. E. A. Sandford Fawcett, Inspector, for sanction to a loan for 5,000*l.* for works of main sewerage and sewage disposal. The scheme has been designed by Messrs. D. Balfour & Son, civil engineers, London and Newcastle-on-Tyne. The whole of the town is to be properly sewered with fireclay socketted pipes, and, where subsoil is wet, Hassall's water-tight jointed pipes are to be used, especially adjoining the rivers Ouse and Ouzel. The sewage will discharge into an underground storage tank, from which it will be lifted by centrifugal pumps driven by gas-engines in duplicate, and forced through a rising main to the Disposal Works, where it will be specially treated by chemical or bacteriological tanks and land.

LOWESTOFT (NEW) PIER.—A Parliamentary Bill has been prepared for granting powers to a new company to construct a pier at Lowestoft. The proposed pier will extend seawards for a length of about 233 yards, and will have an approach road to be made from the junction of Whapload-road and Lighthouse-score, and extending eastwards for about 370 yards to the beach at a spot distant, northwards, 610 yards or thereabouts from the Low lighthouse. The pier will be provided with a theatre, saloons, concert and assembly rooms, shops, and so on.

FOREIGN.

FRANCE.—The jury in the competition for a group of schools for the Municipality of Saint Mandé have awarded the first premium to MM. Berthier & Berard, of Paris; the second to M. Letrosne (Paris), and the third to M. Borgeaud (Saint Mandé).——The Corporation of Nice propose to purchase, for a public park, the fine estate of the Comte de Chambrun, recently deceased, and to place a commemorative statue to him in a marble rotunda to be erected in the grounds.——M. Paul Samary, architect, has been commissioned by the Government to design the Indo-China palace for the 1900 Exhibition.——The excavations undertaken by M. Gauckler, Director of Arts and Antiquities in Tunisia, at Carthage and Dermah, have resulted in some interesting discoveries. After getting though the layer of Byzantine *débris* containing tombs and mosaics, he came on the Pagan stratum, in which he found a colossal head of Marcus Aurelius, and two large mosaics representing naval battles and hunting scenes. In the ruins of the temple of Jupiter Ammon have been discovered four statues of priestesses, gilt and coloured and in fair preservation, eight statuettes in marble, and other fragments; and various tombs containing Carthaginian pottery, terra-cotta masks, and other objects.——The death is announced, at the age of sixty-eight, of M. Jules Cousin, honorary curator of the Carnavalet Museum, of which he was the founder, and of the Municipal Library, to which, after the Commune, he gave 6,000 volumes and 8,000 engravings relating to the history of Paris. He was author of various important archæological works.——The death is also announced, at the age of eighty-six, of M. Charles Marie Mesnager, member of the Société Centrale des Architectes, who in former days took part in the works of the fortifications of Paris and in those of the Hôtel de Ville and the College of France. He was a pupil of the Ecole des Beaux Arts, and in 1869 obtained an honourable mention, in connexion with the Bordin prize, for his essay on "Les principles et les règles générales de l'Architecture"

PENANG.—The Commissioners have called for and obtained tenders for the erection of the Diamond Jubilee Clock Tower, the result being that the lowest is about 60 per cent. above the amount proposed to be spent when designs were advertised for. It will be remembered that the Municipal Engineer's design was placed first, and it was afterwards decided that his design be carried out, but that another architect be called in to superintend the work, prepare details, and contract. One architect and one engineer were then asked what commission they would accept, the former naming 7½ per cent. and the other 5 per cent. The latter was accepted, and he prepared the specification and contract. It appears that in this colony it is usual for the architect to charge 10 per cent. for drawings, specification, and the superintendence of work, which sum includes payment of clerk of works, and on this occasion nothing was said to lead any one to think that the usual conditions would be departed from. However, it appears from the specification that the contractor is to pay to the superintending architect 100 dols. a month for a clerk of the works, and as the time of erection is twenty months, this makes a considerable difference. There are several strange clauses in the contract, such as, "The contractor is to supply full-size drawings of certain carved work." If the contractor supplies bad sand or other material he has to pay a fine to the architect. So far a start has not been made. A scheme for lighting Penang with electric light has, we believe, been sanctioned, and is likely to be put in hand.

SINGAPORE.—The Committee of the Diamond Jubilee Town Hall are not much further advanced than they were a year ago, as they are still looking for a site. Designs were called for a building on a certain site, but this site is likely to be abandoned, as it is a very bad one.

MALAY PENINSULA.—The railway is being rapidly pushed on both north and south, and before long the several sections will be joined together and the line from Penang to Malacca completed.

THE BRITISH FIRE PREVENTION COMMITTEE.—The British Fire Prevention Committee, the establishment of which was the outcome of the Paris Charity Bazaar and Cripplegate fires, has now become a fully incorporated scientific society under the special sanction of the Board of Trade. It will be known as such from March 1.

MISCELLANEOUS.

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS.—Mr. Ernest Runtz, architect, of 10, Walbrook, has taken in partnership Mr. Albert C. Bredon and Mr. G. McLean Ford, who have been with him for some years, and the firm will now be that of "Ernest Runtz & Co., architects."——Messrs. D. Balfour & Son, civil engineers, of Newcastle-on-Tyne, have changed their London office from 28, Victoria-street to Westminster Chambers, 1, Victoria-street, S.W.——Mr. G. Chatterton, civil engineer, has removed his offices from 46, Queen Anne's-gate, to 6, The Sanctuary, Westminster.——The Patent Impervious Stone Company have removed their chief office from 9, Victoria-street, Westminster, to Rutland Wharf, Hammersmith, W. The office in Victoria-street will be retained as a branch office only.——The firm of Walter & Hensman, builders and contractors, &c., at Horncastle, is dissolved, and in future the business of builder and contractor will be carried on by Mr. Charles Hensman on his separate account. The agency for the Groby Granite Company will be retained and carried on by Mr. W. Baker Walter.

FOUNTAIN AT SOUTHEND, CATFORD.—The fountain which has been erected at the south-west corner of the junction of Bromley-road and Beckenham-lane, Southend Village, Catford, in commemoration of the completion of the sixtieth year of her Majesty's reign, was opened recently. The fountain, the base of which is of grey granite, with four basins, has a slender shaft of Portland stone, surmounted by a floriated cross. It has been erected from the design of Mr. R. Creed, of London.

"OLD KENSINGTON."—The *Athenæum* states that the collection of sketches, in black and white, that were made for the illustration of the Rev. W. J. Loftie's book, has been secured for the local Public Library. The collection includes views of some interesting houses which have been pulled down within the past ten or fifteen years. In some of our public libraries the formation of similar collections relating to their own respective districts is by no means neglected; the practice should be encouraged, so as to render each library a place of deposit for authentical particulars upon the history and topography of the district.

STREET IMPROVEMENT IN THE STRAND.—It is intended to demolish the buildings between Arundel-street and Norfolk-street, Strand, and to erect new premises for shops and offices. It is not proposed to set the Strand frontage back in view of the fact that the County Council has acquired the Holywell-street block opposite, in connexion with their Holborn to Strand improvement scheme.

THE NEW PARLIAMENT-STREET.—The new roadway in Parliament-street, in connexion with the improvement scheme at Westminster, is already completed, and on Tuesday this week the barriers were removed and it was opened to traffic. The work has been pushed forward by the contractors, Messrs. John Mowlem & Co., and large gangs of men, ranging from fifty to 200, have been constantly employed.

DUNDEE MASTER BUILDERS' ASSOCIATION.—At the ninth annual meeting of the Dundee and District Master Builders' Association, recently—Mr. James Powrie, the President, in the chair—the Committee of Management, in their annnal report, congratulated the members on the prosperity which had continued to attend the building trades during the past year. It was satisfactory to reflect that during the year there had been little or no friction with the employees in any of the trades represented by the Association. The attention of the Association was much occupied during the earlier part of the year with the question of how best the employers could be insured against the heavy burden placed upon them by the Workmen's Compensation Act. Prior to the passing of that Act it was the universal custom of employers to ensure themselves against liability to their workmen at common law, and under the Employers' Liability Act at a rate of insurance of about 4s. per 100*l.* of wages paid. On the passing of the Workmen's Compensation Act, however, it was announced by the insurance companies that to cover liability under that Act they would be obliged to charge premiums at a rate of about 2*l.* per cent. It was felt by the members of the Association that this increase was quite excessive in proportion to the additional risk, and the question of starting a Local or National Mutual Indemnity Association was discussed. Latterly, however, one of the insurance companies quoted a rate which was little more than 50 per cent. of the original quotation, and the competition thus engendered amongst the various companies had ultimately the effect of reducing the current rate for builders' liability to something like 1*l.* per cent. Even this rate was excessive. An effort was made to get the architects to insert in their schedule a special item for the cost of the insurance against liability to workmen, but to this request the architects did not agree. In Aberdeen the architects had agreed to insert such an item. Complaint had been made against the architects issuing schedules with the arbiters' names filled in, but the Council of the Architects' Institute had passed a resolution declaring that in their opinion the rules, as framed, left it competent for the architect either to issue schedules with the arbiters' names blank or with the names filled in, leaving it optional to the contractor to object to the arbiters' names when it was proposed to accept his offer. The Association had protested against this construction of the rule as fallacious and mischievous, and the committee were of opinion that in the interests of the Association this question should be pushed to an issue. The following office-bearers were appointed:—President, Mr. D. P. How; Vice-President, Mr. W. Farquharson; Secretary and Treasurer, Mr. Joseph Wilkie, solicitor.

ELECTRIC LIGHTING AT DONCASTER.—On the 21st ult. a Local Government inquiry was held at Doncaster by Mr. H. H. Law, one of the Inspectors of the Local Government Board, with respect to an application by the Corporation to borrow 30,000*l.* for the purpose of lighting the town by electricity. The case was laid before the Inspector by the Town Clerk (Mr. T. B. Sugden), and evidence was given by Mr. W. H. Crabtree, Borough Surveyor, and Mr. J. N. Schoolbred, Electrical Engineer.

PROFITS OF BRICKMAKING.—Mr. Daniel Watney sat as arbitrator on the 22nd ult. at the Surveyors' Institution, Savoy-street, to hear the claim, Bachelor *v.* the Brompton, Chatham, Gillingham, and Rochester Water Company, for compensation in respect of land taken under their Act of 1898 by the company for the extension of their works. The claimant, Mr. R. J. Bachelor, of Chatham, who is a brickmaker and contractor, is the owner of the Darley Farm, the Chatham Farm, and several other properties in the district, nearly twenty acres of which the water company has acquired. Since 1892 he has, in the Darley field, been engaged in making bricks, and in 1896 purchased the Chatham field for the extension of his works. During the three years, 1896-7-8, the average cost of the bricks had been 15s. 4½d. per 1,000, and the selling price 30s. 10d. per 1,000, whilst the profits during the same period had been over 10,000*l.* He claimed the sum of 78,958*l.* for the value of the land taken and compensation for disturbance. It was estimated, on behalf of the claimant, that there was enough brick earth on the land to make 48,149,201 bricks, and it was contended that he was entitled to the profits, discounted for twelve years, which he could have made if he had been left in possession. The inquiry was adjourned.—*Daily Telegraph.*

WILL OF THE LATE MR. W. ROBERTS.—By the will of Mr. William Roberts, architect and surveyor, of Manchester, who died recently, 23,850*l.* are left for public purposes. A sum not exceeding 4,500*l.* is set apart for the erection of a bronze statue in Manchester in memory of Mr. Gladstone; and 4,000*l.* is to be devoted to the erection of a Unitarian chapel at Brook's Bar, Manchester. The other bequests include 2,000*l.* for the Hulme Grammar School, Manchester; 1,200*l.* for a lifeboat on the Welsh coast, to be called *The William Roberts;* 1,050*l.* to the Manchester Infirmary; 1,000*l.* to the Old Trafford Deaf and Dumb Schools; 1,000*l.* to the Welsh Theological College, Bala; 1,000*l.* to the Unitarian Home Missionary College, Manchester; 1,000*l.* to the Northern Counties Hospital for Incurables; and many other benefactions, varying in amounts from 100*l.* to 500*l.*

CLOCK TOWER, EASTGATE, CHESTER.—A clock tower is being erected on the Eastgate, Chester, as a Diamond Jubilee memorial. The clock was supplied by Messrs. Joyce & Co., the ornamental ironwork being by Mr. James Swindley, of Handbridge. Messrs. Douglas & Minshull are the architects.

BURTON BUILDERS AND THE COMPENSATION ACT.—A meeting of the members of the building and allied trades of Burton was held at the Midland Hotel recently to discuss the advisability or otherwise of forming a Mutual Association to meet the provisions of the Workmen's Compensation Act, 1897. It was eventually decided by 13 votes to 1 to form a Mutual Association, and a number of directors were nominated.

THE TAVISTOCK-ROAD IMPROVEMENT, PLYMOUTH.—Nearly all the owners of property on the east side of Tavistock-place, Plymouth, waited as a deputation upon the Special Works Committee of the Plymouth Borough Council on the 20th ult. to protest against the adoption, without at least some substantial modification, of the premiated design for the reconstruction of the houses forming the east side of Tavistock-road and the west side of Tavistock-place.—Mr. J. J. Marshall, who introduced the deputation, pointed out that they were in no sense hostile to the improvement of Tavistock-road, but objected to certain features in the design of Mr. Herbert T. Buckland, which had been awarded the premium offered by the Council of 250*l.* The deputation explained that what they chiefly objected to was the proposal to practically convert Tavistock-place into a back lane by placing the backs of the new houses, which would front Tavistock-road, towards Tavistock-place. To a row of shops facing Tavistock-place they would have no objection and a strong preference was expressed for another of the competitive designs, which provided for a double row of houses on the site to be cleared—one facing Tavistock-road and the other consisting of smaller houses two stories high facing Tavistock-place. The Chairman (Mr. Law) invited some practical suggestions from the deputation, but the Rev. J. M. Hodge replied that that was a matter for the Corporation experts. All the deputation desired was that the plans might be so modified as to enable Tavistock-place to retain somewhat the character of a front street. After the deputation had withdrawn the committee discussed the subject. Whilst, however, it was conceded that any modifications which could reasonably be made in the plans to meet the objections of the owners should be done, it was felt it would be wrong for the Corporation to violate its own by-laws, and practically the whole question was relegated to the Council to determine at its next meeting.

THE LONDON SKETCH CLUB.—The private view of the London Sketch Club's Second Exhibition will take place at the Modern Gallery, 175, Bond-street, W., on Tuesday, March 7, and the Exhibition will be open to the public from the 8th to the 18th inclusive. This exhibition will consist only of the "Time Sketches" painted in the gallery.

HOME ARTS AND INDUSTRIES ASSOCIATION.—The fifteenth annual exhibition of the work done in the classes of the Home Arts and Industries Association will be held from May 11 to 15, in the gallery of the Albert Hall. There will be exhibits from a large number of classes throughout the United Kingdom. The exhibition will include wood carving, inlay, metal repoussé, embossed leather, spinning and weaving, and many other applied arts.

NATIONAL REGISTRATION OF PLUMBERS.—At the annual meeting of the North of England District Council, held at Middlesbrough on the 23rd ult., a resolution was passed to the effect "That this meeting, recognising that the qualification of Medical Officers of Health, and the qualification and certification of Sanitary Inspectors have been provided for under the Public Health (London) Act, 1891, is of opinion that it is requisite for such statutory provisions to be extended to secure the adequate qualification, certification, and registration of qualified plumbers, upon the efficiency of whose work the healthiness of a house virtually depends." Professor Bedson then delivered a lecture on "Dust and its Relation to Sanitation."

CANON BENHAM ON WINCHESTER CATHEDRAL.—On Monday Canon Benham gave a lecture on Winchester Cathedral at the London Institution, the first part of which consisted of a review of the events that led to the foundation of our ancient towns and their cathedrals, the origin of their names, and the invasion and settlement in Britain of Saxons, Jutes, and Angles under the name of Englishmen. For four centuries Britain had been a province of the Roman Empire, ruled from the great cities such as York and Lincoln. In 411 Rome recalled her legions from Britain to defend Italy from the Goths, and they never again returned to this country. Englishmen first landed on the Isle of Thanet. It was exactly on this spot that Saint Augustine landed more than a century afterwards, now 1,300 years ago. Comers up from the sea on the south coast, first Celts then English, worked their way up the river Itchen (now a mere fishing stream), and there, under the shelter of the downs, built their inland city, known in the earliest records as Gwent (=the White City) of the Belgæ; Venta Belgarum, the White Town, explained to any visitor by the chalkey nature of the soil on all sides visible. After the general scramble for possession of the land by the invaders, Britain was divided into kingdoms, the strongest of which proved to be that occupied by the West Saxons, called Wessex. They made Venta their capital, only they dropped the Belgarum and called it instead Vent Fortress—Winchester. Some of the fortifications are still to be seen. The expelled Britons were Christianised, in name at any rate, by the Romans; the invaders were heathens. In 633 came Birinus, the monk, to convert the conquerors to the Christian faith. He baptised the King of Wessex at Winchester, and the king was anxious to have a cathedral in his capital, and in 646 it was begun, and finished in 648. There may be in the crypt some remains of the original church, because whereas the oldest churches were built with timber and roofed with reeds, Winchester is said to have been a novelty, being built of stone, and much finer than any that had been built yet. The first bishop died in 650. Passing rapidly over the olden days, the lecturer referred to the most famous of the early bishops—S. Swithun, born between 852 and 862. At this time the Danes were in full swing with their invasion of England. They burnt Canterbury Cathedral and killed its bishop, Alphege. Swithun, a zealous builder, persuaded the King, no other than Alfred the Great, to build a strong wall round Winchester, which effectively kept the invaders out. In 980 the cathedral was rebuilt and rededicated with such pomp as had never been seen in England. Not only the King, but nearly every duke and noble was there, and nine bishops, including the famous Dunstan. After the Norman Conquest, William made his cousin Walkelin Bishop of Winchester. In 1079 he began to build his cathedral from his own plans, but funds ran short. Shortly after Walkelin's death the central tower fell in. In those days restoration and additions were made in the style then in vogue, with no thought of following existing lines. In the case of Walkelin's tower, however, Bishop Godfrey made a notable exception; out of respect to Walkelin's memory, he rebuilt it on the Norman plan. This was in the year 1200. He removed the Norman east end and rebuilt it in the Early English style. In the fourteenth century Edyngdon pulled down Walkelin's Norman nave and the great west towers and built the present west front. After him came the great William of Wykeham, architect and prelate. He did not pull down, but transmuted

Walkelin's heavy Norman work into the graceful beauty of the Perpendicular style. Thus, with a few minor alterations, Winchester Cathedral took the form it has retained ever since. The lecturer took his audience a tour of the cathedral and the city, pointing out the interesting features in order, and illustrated his remarks with limelight views.

THE STRAND AND CLARE MARKET IMPROVEMENTS.—Mr. H. T. Steward, F.S.I., the arbitrator appointed to decide the value of properties acquired by the London County Council under the Housing of the Working Classes Act, 1890, in connexion with the Strand and Clare Market scheme, commenced his inquiry at the offices of the Strand District Board of Works, Tavistock-street, Covent Garden, on the 27th ult. The first claim was in respect of the "Hope Tavern," Blackmoor-street, which is held on lease for a term of which twenty years are unexpired at Lady-day next at 70*l.* a year. Mr. Thomas J. Weaver, public-house valuer, expressed the opinion that 8,000*l.* could be got as a premium for a sixty years' lease. Witness had applied the 4 per cent. table. His total valuation, including the usual 10 per cent. for forced sale, was 6,567*l.* These figures were supported by the evidence of other experts. On behalf of the London County Council, Mr. Thornton and Mr. Weatherall, F.S.I., had taken the rental of 70*l.* a year on the 4 per cent. table, 952*l.*; value in possession, 100*l.* per annum, 1,919*l.*; 4 per cent. table, twenty-five years' purchase, 2,500*l.* Their total valuation was 3,362*l.* In regard to the "Grapes Tavern," Drury-lane, and the "Artichoke," Clare-street, the arbitrator was asked to make an award of 3,647*l.* and 7,200*l.* respectively.

CHEAPSIDE IMPROVEMENT.—On Monday workmen began to pull down business premises having frontages in Cheapside and St. Paul's Churchyard, with a view to the widening of the western entrance to Cheapside. In rebuilding, the street-line will be placed back several feet. The improvement scheme also provides for the widening of the roadway at the junction of Newgate-street and Cheapside.

OLD ENGLISH PLAYHOUSES.—The series of free lectures on matters connected with building, organised by the Carpenters' Company, came to a conclusion on Monday, when Mr. William Poel, director of the Elizabethan Stage Society, gave an address on "English Playhouses in the Sixteenth, Seventeenth, and Eighteenth Centuries." Mr. Poel's lecture was illustrated by a number of lantern slides, taken from old woodcuts and drawings. With these he showed the manner in which dramatic representations had been given in England from very early times. The origin of the drama was found in the religious mysteries, which were acted often in front of the cathedrals and churches. Then there was the outdoor pageant, the drama in the court-yard, and the bear-baiting ring, a kind of amphitheatre with raised seats for the spectators. From these early experiences the builders must have determined the earliest design for a playhouse, taking the circular shape from the bear-ring, and the stage from the raised platform used in inn yards. The building of the first playhouse was due to the banishment of the players from the City in 1576. There were then five playhouses in inn yards in the City, but the streets were too narrow to serve as approaches for the crowds of people who wished to enter, and this caused the removal of the drama to the Surrey side of the river. He showed slides bearing on the Elizabethan method of representing plays, and a series of pictures showing the great alterations that took place in theatres as time went on.

RIDDLESWORTH, NORFOLK.—The fine old mansion known as Riddlesworth Hall, dating from 1780, which on the 10th ult. was the scene of a most destructive fire (little being left beyond the bare walls), will, we understand, shortly be rebuilt from designs of Mr. Herbert Green, architect, of Norwich. The building is covered by insurance to the extent of 20,000*l.*

EXETER GUILDHALL.—At a meeting of the Exeter City Council on the 22nd ult., the Estates Committee recommended that the City Surveyor be instructed to insert steel girders inside the stonework of the Guildhall front at the level of the room over the arches, in accordance with his suggestion at an estimated cost of 35*l.* The Surveyor had pointed out that this work was only preliminary to the restoration of the whole front, and recommended that the fixing of the steel girders should be done when the arch centres and boarding for the restoration work were in place, so that each stone of the front could be bolted to the steel longitudinal piece. Upon this the Committee further recommended that Mr. Read be employed to carry out the restoration of the stonework of the front of the Guildhall under the direction of the architects to the Society for the Protection of Ancient Buildings. The recommendations of the Committee were adopted.

GLASGOW BUILDING TRADES EXCHANGE.—The annual dinner of the members of the Glasgow Building Trades Exchange was held in the Windsor Hotel on the 24th ult. Colonel Robert J. Bennett presided. Mr. William Anderson proposed "The Navy, Army, and Reserve Forces," and Mr. Gray replied. Mr. James Goldie then gave "The City of Glasgow." Bailie Carswell replied. Mr. Walker, Newcastle, proposed "The Glasgow Building Trades Exchange." He mentioned that following the example of Glasgow a building trades exchange had been formed in the Tyneside burgh, and that there were between 170 and 180 members, and that they had been able to do some good work in connexion with a city improvement scheme. The Chairman, in replying, said that owing to the absence of the President, Sir William Arrol, he had the honour to preside for the second time at the annual dinner. The exchange was barely five years in existence, they were entirely free of debt, and both financially and numerically stronger than they had been at any time of their existence. Besides, the exchange prevented them living in cliques, isolated from each other; it had enabled them to show individually a little of that spirit of unity that brought men together, that made them march shoulder to shoulder, and led them to victory. They did not run the exchange for sentiment. It was a business enterprise, managed and conducted on business principles. Brains and skill were what they claimed for its members, combined with honesty of purpose in carrying out their contracts. The Exhibition Committee, in his opinion, wisely sent three delegates in the beginning of the year to the United States to see what they could learn from the past experience of the great Chicago Exhibition. He thought it would be well if the Municipality of Glasgow were in closer touch with the architects, surveyors, and the Builders' Exchange in erecting all public buildings.

A RAILWAY UP MONT BLANC. — A contractor connected with "Travaux Publics" department of Paris has announced his intention to undertake the construction of a railway from the base to the summit (or nearly so) of Mont Blanc. A Technical Committee appointed by the Faculté des Sciences of Lyons has examined the project and reported favourably on it. The proposed railway would start from the village of Houches and be continued to a point about 250 mètres below the summit, and 80 mètres higher than the Janssen observatory. It is proposed to be a rope traction railway worked by electric power, and the cost is estimated at 10 million francs.

CAPITAL AND LABOUR.

ABERDEEN MASONS.—The operative masons and stonecutters in the building branch have asked a rise of ½d. per hour, the standard rate of wages being at present 8d. per hour. They are also to join the monumental branch in pressing a demand for payment of wages weekly in place of fortnightly. The masters having refused the men's demand, a conference will be held. Should this prove abortive, the question at issue will be referred to arbitration.

ABERDEEN HOUSE PAINTERS. — The Aberdeen House Painters' Union demanded an increase of wages from 7½d. to 8½d. per hour. The employers offered a rise of a ¼d., whereon the operators belonging to the union resolved to abide by their demand, and came out on strike on March 1 to the number of upwards of 300.

LEGAL.

IMPORTANT ANCIENT LIGHT DISPUTE AT BROMLEY.

THE case of Brown and others *v.* Collings came before the Court of Appeal, composed of the Master of the Rolls and Lords Justices Rigby and Vaughan Williams on the 25th and 27th ult., on the appeal of the plaintiffs from an order of Mr. Justice Byrne in the Chancery Division. The case was reported in the *Builder* of July 30, 1898. The action was brought by Mrs. Ellen Elizabeth Brown, the Rev. John Thomas Brown, and Mr. Chas. Webb, the owners in fee simple of certain dwelling-houses known as Nos. 83 84, 85, and 86, High-street, Bromley, Kent, and by Jane Lynes, the lessee of No. 83, Elizabeth Deane, the lessee of No. 84, and Mr. Isaac Gunton, the lessee of Nos. 85 and 86, for a mandatory injunction to restrain the alleged infringement of ancient lights. There was an alternative claim for damages.

Mr. Astbury, Q.C., and Mr. Dunham appeared for the plaintiffs (the appellants); and Mr. Eve, Q.C. and Mr. Chas. Crawley, for the defendant (the respondent).

Mr. Astbury said that the plaintiffs appealed from a decision of Mr. Justice Byrne dismissing their action for an injunction. Mr. Justice North, before whom the case came on a motion for an interlocutory injunction, had no hesitation in granting it, and when the case was opened before Mr. Justice Byrne, when the plaintiffs' first witness was in the box, that learned Judge was a good deal impressed by the model and by the judgment of Mr. Justice North, and suggested that if he granted an injunction in the ordinary terms, prohibiting the defendant from allowing such part of his building which interfered with the plaintiffs' ancient lights to remain, the defendant might not know how much to take down, and if he took down what he thought right the plaintiffs might not be satisfied, and then the whole thing might have to be fought over again on a motion to commit.

The Master of the Rolls: You want a mandatory injunction?

Mr. Astbury said he did. The learned counsel then explained that High-street, Bromley, in which the premises in question were situated, was one which was being largely improved. A large quantity of new buildings had been put up in the street, and the plaintiffs' property, which happened to be very old, was valuable for pulling down and rebuilding on the site. The ancient lights were admitted, and were, of course, very valuable. Although there were sixteen windows in all, of which it was said the defendant had obscured the light by his building, he (counsel) should only trouble their Lordships with four, which were the principal as being on the ground floor. These windows faced south-west and in the best position to get the sun. Those windows for over twenty years looked over a low shed—about 10 ft. high at one end and 14 ft. at the other. This little building was distant from the windows 65 ft., so that the plaintiffs had practically an uninterrupted sky area. The defendant recently obtained a building lease of this piece of land, and upon the site of the little shed, without any notice to the plaintiffs, started to put up a building which was to be 33 ft. high up to the eaves and 44 ft. high up to the roof. The result of this was disastrous to the plaintiffs' light. At the latter height it was hopeless to expect the plaintiffs to get any sun at all except during the summer months. Mr Edward Gruning, who had reported on the matter to Mr. Justice Byrne, was of opinion that the defendant's building had not substantially interfered with the plaintiffs' light, but that the plaintiffs had themselves, within the last few years, materially diminished the access of light to their windows or some of them by raising and prolonging certain back additions in the rear of and at right angles to the houses. For this reason he thought that the angle of light should be taken at thirty degrees, and not the usual forty-five degrees. The learned counsel said that he disagreed altogether with this report. It was perfectly idle for anybody to say that the defendant's building had not taken away twenty-two degrees of the most valuable light to the plaintiffs' windows. Their Lordships would see that Mr. Justice Byrne had not even given the plaintiffs damages. A man's property in his light was just as much his own as the bricks in his walls, and another man could not come and take a material part of such light and say that, in his opinion, the other had got quite sufficient light. The plaintiffs considered that their property was ruined for building purposes if the defendant's building were allowed to remain. Professor Smith, Professor of Architecture at University College, who was the highest authority the plaintiffs could get on the subject, had visited the *locus in quo*, and had stated that the light to the plaintiffs' lower windows had been greatly interfered with by the defendant's building. The learned Counsel submitted that Mr. Justice Byrne had not given sufficient weight to the evidence of the plaintiffs' witnesses, and had given too great weight to Mr. Gruning's report.

Mr. Eve, for the respondent, submitted that Mr. Justice Byrne's decision, fortified as it was by Mr. Gruning's report, following his personal inspection of the premises in question, should be upheld.

The Master of the Rolls: It strikes me that Mr. Gruning has approached the matter from the point of view that the plaintiffs had got a sufficiency of light, and has not taken into consideration the amount taken away.

Mr. Eve replied that not one of the plaintiffs' witnesses agreed as to which of the windows was most affected by the defendant's building. The learned counsel then referred in detail to the plaintiffs' expert evidence, and asked their Lordships to come to the conclusion, as Mr. Justice Byrne did, that it was unreliable. In considering whether there had been substantial interference with light, the Court must take into consideration the nature of the premises and the locality in which they were situate and the purposes for which the light might be wanted. In the present case the plaintiffs could not expect to have for all time an unobstructed view over a park. Bromley was a growing place——

Lord Justice Vaughan Williams: It is not because your villa is built near London and you have enjoyed for more than twenty years absolutely unobstructed light, that at the end of twenty years somebody is to be entitled to obstruct your light.

Mr. Eve: What I mean is this. When you have got to consider the value of the obstruction of the light you must look at the things as they then exist, and if the villa has ceased to be a villa residence, and the street in which it is situated has become a commercial street, then in arriving at what is substantial interference you must arrive at what light a man had got before and the amount he has got left, put the one with the other, and consider whether the difference is substantial.

Mr. Crawley having followed on the same side, the Master of the Rolls, without calling upon Mr. Astbury for a reply, in giving judgment, said he had come to the conclusion that Mr. Justice Byrne's judgment ought to be reversed. This was a question of obstruction of light to ancient windows, and the model showed the windows most seriously affected by the defendant's building. In considering these light cases, one must consider what light came to the ancient windows before they were interfered with, and what light came to them since the obstruction. It was a question of degree whether

there had been such obstruction or diminution of light as to render the premises uncomfortable or unfit for the ordinary purposes of habitation or of carrying on business. He (the Master of the Rolls) agreed that a considerable portion of the plaintiffs' evidence had been greatly exaggerated, but making all allowances for extravagant statements, he still felt driven to the conclusion that a considerable quantity of light which had formerly access to the plaintiffs' windows had been cut off by reason of the defendant's building. There ought to be an injunction to compel the defendant to pull down so much of his building as obstructed the access of light as previously enjoyed in the plaintiffs' buildings. As a guide to the parties he (his Lordship) thought the evidence showed that the defendant's building should not be above 25 ft. high, and unless it was pulled down to that height there would probably be a difficulty. That, however, was only a hint thrown out for the guidance of the parties. The order, of course, would be drawn up in the ordinary form, and the defendant would have to pay the costs of the action and of the appeal.

The Lords Justices concurred.

It was arranged that the defendant should have three months within which to carry out the order of the Court.

EMPLOYERS' LIABILITY CASE

THOMAS COOPER, a carpenter and joiner, sued Mr. William Shepherd, builder, at the Southwark County-court, on the 23rd ult., under the Employers' Liability Act, to recover damages for personal injuries. Plaintiff was at work at the Borough Polytechnic on a board which slipped, and he fell to the ground, breaking one of his legs. Judge Addison, Q.C., said it was a clear case for compensation under the Act, and awarded plaintiff 100*l.* and costs.

MEETINGS.

FRIDAY, MARCH 3.

Architectural Association.—Mr. A. Saxon Snell on "Public Baths." 7.30 p.m.

Glasgow and West of Scotland Technical College (Architectural Craftsmen's Society).—Mr. James M'Kissack on "Half-timber Work." 8 p.m.

Institution of Junior Engineers (Westminster Palace Hotel).—Paper on "Carbon Consuming Batteries and their Possibilities," by Mr. W. R. Cooper, B.Sc., illustrated by experiments. 8 p.m.

Royal Institution.—The Right Hon. Lord Rayleigh on "The Mechanical Properties of Bodies." IV. 3 p.m.

SATURDAY, MARCH 4.

South Kensington Museum (Lecture Theatre).—Mr. William Burton on "Pottery." II. 3.30 p.m.

British Institute of Certified Carpenters.—Visit to the Prudential Assurance Offices at 3 p.m. Mr. H. A. Davey on "Shoring," at 6 p.m., at Carpenters' Hall.

St. Paul's Ecclesiological Society.—Visit to the Catholic Apostolic Church in Gordon-square. 2.45 p.m. at the east entrance.

Sanitary Inspectors' Association.—Professor W. W. F. Pullen on "Furnaces and Smoke Prevention." 6 p.m.

MONDAY, MARCH 6.

Royal Institute of British Architects.—(1) Special general meeting to elect the Royal Gold Medallist for the current year; (2) Business meeting for the election of candidates for membership, &c. (see p. 222); (3) Mr. A. C. Dickie on "Some Early Christian Churches in Palestine." 8 p.m.

Royal Academy.—Lectures on "Greek Sculpture," by Dr. A. S. Murray. V.—"Chariot Groups." 4 p.m.

Surveyors' Institution.—Mr. F. J. Smith on "The Working of the Light Railways Act, 1896." 8 p.m.

Society of Engineers.—Mr. E. Wynter Wagstaff on "The Shan Hill Country and the Mandalay Railway." 7.30 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Lecture by Dr. Alfred Hill. 8 p.m.

Liverpool Architectural Society.—Mr. Edward S. Prior, M.A., on "Business in Architecture." 6 p.m.

Leeds and Yorkshire Architectural Society.—Exhibition of Institute Drawings. Nomination of Officers. 6.30 p.m.

TUESDAY, MARCH 7.

Institution of Civil Engineers.—(1) Mr. J. T. Milton on "Water-tube Boilers for Marine Engines"; (2) Sir A. J. Durston on "Recent Trials of the Machinery of War Ships." 8 p.m.

Northampton Institute, Clerkenwell.—Lectures on Mediæval Architecture, by Mr. Francis Bond, M.A. IX.—"Anglo-Saxon and Irish Architecture." 7.45 p.m.

Glasgow Architectural Association.—Mr. W. S. Tucker on "A Holiday in the South of England." 8 p.m.

WEDNESDAY, MARCH 8.

Architects' Benevolent Society.—Annual general meeting of the subscribers and donors will be held in the rooms of the Royal Institute of British Architects. 5 p.m.

Sanitary Institute.—A discussion to be opened on "The Establishment of Public Abattoirs in the Metropolis in relation to the Prevention of Tuberculosis," by Dr. William Arthur Bond, M.A. 8 p.m.

Sanitary Institute (Demonstrations for Sanitary Officers).—Inspection at L.C.C. Municipal Lodging House, Parker-street, Drury-lane. 3 p.m.

Society of Arts.—Mr. J. H. Collins, F.G.S., on "Cornish Mines and Miners." 8 p.m.

Liverpool Engineering Society.—Paper by Mr. Brysson Cunningham. 8 p.m.

Edinburgh Architectural Association.—Mr. J. Campbell Irons on "The Architectural Antiquities of Leith." 8 p.m.

Northern Architectural Association.—Annual meeting. 7.30 p.m.

THURSDAY, MARCH 9.

Royal Academy.—Lectures on Greek Sculpture, by Dr. A. S. Murray. VI.—"Neo-Attic Sculpture." 4 p.m.

Society of Antiquaries.—8.30 p.m.

Royal Institution.—Mr. William Poel on "English Play-houses in the Fifteenth, Sixteenth, and Seventeenth Centuries." I. 3 p.m.

Institution of Electrical Engineers.—8 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Dr. J. F. J. Sykes on "Objects and Methods of Inspection, Nuisances, &c." 8 p.m.

FRIDAY, MARCH 10.

Institution of Civil Engineers (Students' Meeting).—Mr. H. Lapworth on "The Construction of the Elan Aqueduct, Birmingham Waterworks." 8 p.m.

SATURDAY, MARCH 11.

Edinburgh Architectural Association.—Visit to Colinton House, Colinton Castle, and Redhall.

Royal Institution.—The Right Hon. Lord Rayleigh on "The Mechanical Properties of Bodies." V. 3 p.m.

Sanitary Institute (Demonstrations for Sanitary Officers).—Inspection at Frien Barnet Sewage Works. 3 p.m.

Institution of Junior Engineers.—Conversazione at Westminster Palace Hotel. Reception at 7 p.m.

RECENT PATENTS:

ACCEPTED SPECIFICATIONS.

Open to Opposition until April 22.

[1897] 26,810, Evans, Lamps. 29,433, Kinsey; [1898] 1,154, Drummond; 3,835, Harrison; 8,683, Aykroyds; and 12,182, Sardi, Generation of Acetylene Gas. [1898] 4,241, Sutcliffe, Noiseless Water-closets and Apparatus therefor. 4,438-40, The Canister Machine Company, Cans, Canisters, &c. 4,531, Richmond, Gas Meters. 4,632, De Man, Fire-proof Buildings. 5,326, Chapman, Seal Fastenings. 5,373, Dell, Anti-fouling Compositions, &c. 5,628, Grimshaw & Barnes, Cover for Tanks for Sewage, &c. 6,374, Martins, Detachable Firing Flue for Bakers' Ovens, &c. 6,443, Lingner, Application of Disinfectants. 6,458, Clifford & Frith, Compound for Paving or Covering Roads, Paths, or Floors, and for Making Paving Bricks or Blocks. 6,602, Wilson & Goodman, Stoves and Fire-grates. 6,622, Alcock, Combined Cinder-sifter and Dust Bin. 6,658, Davis, and [1899] 1,036, Vogt, Deep-boring Apparatus. 6,679, Marchant, Valve Seats. 7,603, Kettelwell, Method and Apparatus for Extinction of Fires in Breweries, Distilleries, and Similar Premises. 7,634, Brookes, Artificial Stone. 7,700, Dewar, Shields for Incandescent Electrical Lamps, &c. 7,839, Railton & Campbell, Water Filters 7,848, Penrose and Others, Heat Non-conducting Composition or Paint. 7,938, Gourrier, Gas, Oil, Spirit, and other Stoves. 8,112, Firmin & Firmin, Supply-valves for Lavatories, Wash-basins, Baths, &c. 8,142, Lamme, Systems of Electrical Distribution. 8,348, Heap, Electrical Measuring and Indicating Instruments. 8,380, Stocker and Others, a Liquid for rendering Articles Non-inflammable and for Fire Extinction. 8,595, Heath, Easels for both Indoor and Outdoor Uses. 8,655, Cutler, Dust Interceptor for Water-gas Generators. 8,801, Bentall, Crushing and Grinding Mills. 8,907, Marshall, Breaking-up and Scarifying Roads and other Ground Surfaces. 8,921, Cartwright, Fire Extinguishers. 9,306, Wright, Hot Plates of Gas Cooking Stoves. 9,421, Brodie & Prior, Cooking Ranges. 9,488, Rippingille, Cooking Stoves. 9,575, Walker & Hildred, Cranes. 10,854, Lloyd, Full-way Steel Pipe Water Conduits. 11,053, Briquet & de Raet, Vapour Lamp for Soldering, &c. 15,786, Railton and Others, Ash and other Hoists. 16,754, Bieberstein, Coin-freed Apparatus for Delivery of Electrical Current. 18,533, Harrison, Reversible Sliding Windows. 22,205, Nash, Water Meters. 24,522, Barnsley, Pipe Connexions and Fittings. 25,369, Karger, Compressed Gas Lighting Installations. 26,273, Stendebach, Automatical Gas Igniter. 27,318, Schram & Maundrell, Nozzles for Straining, and Preventing the Spraying of Water, more particularly Applicable to Taps. 27,440, Cramer, Feeding or Charging Apparatus for Cement Kilns and Furnaces. 27,629, Kieley & Mueller, Pressure-reducing Valves. [1899], 73, Williams, Common Blow-pipes. 888, Parker, Cutting Pliers or Nippers. 1,009, Daumas, Plug Cocks. 1,036, Vogt, Deep-boring Apparatus. 1,224, Maurer & Becker, Conveyance and Collection of House Refuse.

ABSTRACTS OF PATENTED INVENTIONS.

24,108.—WATER HEATERS: *J. Winterflood.*—Within the double-jacketted casing is a tubular boiler between two chambers connected to the outlet and inlet pipes, respectively; on its way to the lower chamber the water passes a lift valve and a non-return valve, the boiler being heated by Bunsen burners, and the products of combustion circulating around the heater before their escape; the water inlet and gas valves are fixed upon one spindle, the lifting of the former valve makes a passage for gas to the burners through the latter, when the outlet cock is closed, water no longer flows, and a flexible diaphragm envelopes the spindle—an outlet is attached for any leakage of water; the apparatus is fitted with an independent valve for cutting-off the gas supply, in case of an excess of steam pressure, the valve being shut by means of a diaphragm against which the steam presses through an escape valve.

24,139.—BRICKS: *W. G. Jarvis.*—For facing and fixing bricks an admixture is made of cinder, ash, or coal dust, with equal parts of sawdust and clay or brick earth; the bricks are described as affording a good hold to plaster and mortar.

24,159.—WATER PRESSURE GAUGES: *R. T. & J. G. Glover.*—In order to eliminate error due to variations in the water level is constructed a float, into the bell whereof gas enters through a pipe, and having a central buoyant cylinder carrying a tracer rod, which records variations of pressure on the drum above; the foot of the drum spindle rests upon a frame supported by a ring-float, beneath which is put a guiding frame; the guiding frame works in connexion with another frame, to which guide rollers are attached; by means of a bevel gear the clock drives a slotted spindle, and the upper part of the drum spindle slides in, and turns with, the slotted spindle.

24,178.—PAINTS AND PAINTING: *C. E. Lee & Lawtons.*—For a water-mixed paint, comprising two mixtures, to be separately applied, the one mixture is made of a large number of various substances, amongst which are comprised carbonate of lead, hydrated oxide or silicate of zinc, carbonate of lime, with an aqueous solution of silica prepared by dialysis; to these pigments may be added. The other mixture consists of a solution of the compound silicates of zinc, ammonium, and sodium or potassium, to which may be added certain thickening substances and pigments.

24,179.—CEMENTS: *C. E. Lee & C. F. Lawtons.*—The inventors seek to provide a cement that shall be applicable for cementing sand, gravel, &c., on to the backs of tiles, or for cementing sand, gravel, or crushed stone on to the faces of bricks, or for putting a smooth and hard finish upon brickwork. They powder, and boil in water, a sodium tetrasilicate, which they obtain by fusing together sand, quartz, calcined soda-ash, and charcoal; to this they first add antimonic oxide, and then calcium carbonate, ground quartz, and the ground product of the fusion of quartz, lime, sand, carbonate of soda, and alumina or its silicate. The pasty mass will be improved by finely grinding it in a paint-mill. Colours may be added at will, and certain named natural compound silicates may be substituted for the artificial compound silicate, and iron oxide for lime in the fused compound.

24,219.—FLUSHING AND WATER-WASTE PREVENTERS: *D. Hurst.*—The pressure vessel is formed of lead and steel tubes, arranged concentrically, and with concrete between them, constituting a cylinder into the bottom of which the outlet-pipe projects, and which is perforated to let a part of the flush leak away as an after-flush, the air-pipe enters at either the top, or near the top, of the cylinder. The invention relates to flushing-apparatus specified under No. 3,267 of 1896.

24,224.—LIFT VALVES AND SEATS: *A. D. Curling.*—A removeable seat is screwed into the bottom of the casing of a ball-valve tap (for liquids, gas, and steam), the ball engages with the seat when one lowers the spindle which is recessed to receive a loose piece below the spindle. When the spindle is screwed up the ball rises owing to the pressure of the fluid, which then passes to the outlet.

24,278.—ORNAMENTED SLABS, PANELS, &C.: *G. L. Siever.*—To a perforated sheet-metal skeleton or wire netting, fixed against the wall or other surface, is applied a ceramical paste of the kind that is used for porcelain, and the paste is burned by means of an electrical current or a portable radiating stove; cotton coverings impregnated with a silicate can be used as an insulator, leaving insulating envelopes of silicate around the wires; colouring matters may be mixed with the paste, and the slabs, if enamelled or decorated with vitrifiable substances, may be baked again.

24,290.—GAS AND OTHER LAMPS: *H. Winkler.*—The contrivance is intended to afford means of supporting the globe when it is lowered in order that it may be cleaned or the burner removed; to the lamp's lower end is attached a tapered tube by a hook or similar adjustment, when the globe and its holder are lowered on to the flange of the tapered tube, they may be tilted to one side thereof, or the tube, globe, and holder may be swung aside upon the hook.

24,307.—SPANNERS: *S. Cook.*—In the spanner's head slides a forked jaw on a stem, which slides in a slot in the middle portion of the tool; the stem is threaded to engage with an adjusting nut, which projects through openings in side plates rivetted to the middle part, to which also may be attached a second jaw and a corresponding jaw formed by the ends of the plates and an intermediate piece.

24,313.—SHORING AND STRUTTING: *J. C. Cadman & J. T. Minshall.*—The stop-blocks (as secured to girders for keeping pit-props in position) are fashioned in one piece or in two, and are secured to the girder's lower flange by a wedge-shaped bolt that passes through a hole in the block to bear against the girder and to be tightened up by means of a nut.

24,369.—SASH FASTENERS: *R. C. Chichester.*—In one sash rail is recessed an angle plate, to which is pivotted a locking plate, to be normally forced outwards by a spring that engages with a ledge in the other rail and locks the closed sashes; a plate sliding on the front of the latter rail engages with a groove in the spring push to hold the locking plate when the sashes are to be unfastened or opened.

24,470.—ELECTRICAL JUNCTION BOXES: *J. Shipp & The Telegraph Manufacturing Company.*—The box has detachable sockets for receiving the ends of single or multiple conductors which are fixed therein by means of suitable fillings, and screws attach the sockets to the box; the inner conductors of a concentrical cable have connexions attached by sockets, the external conductors may be secured to lugs formed upon the detachable sockets outside the box.

24,604.—WATER WASTE PREVENTERS AND SIPHON DISCHARGE: *J. H. Harris.*—The lower end of the long leg of the siphon, which is pivotted about an axis, is fashioned to form a tubular valve seated upon the top of the discharge pipe; the flush is started upon the rush of water into the long leg when the siphon is tilted by the action of the pull-chain upon the ball-crank lever and rod, whilst inflow of water during the starting operation is prevented by means of a lateral projection upon the siphon which engages with, and lifts, the float arm.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

February 14.—By DRIVERS (Holloway) (on the Premises).	
Holloway.—5, St. John's Park, u.t. 52¼ yrs., g.r. 5*l.*	£500
February 16.—By FULLER, MOON, & FULLER (at Croydon).	
Wallington, Surrey.—Demesne-rd., 44 plots of building land, area 4 a., f.	1,030
Coulsdon, Surrey.—Smitham Bottom, a block of building land with buildings thereon, f.	1,075
Croydon.—108, Oakfield-rd., and a plot of land adjoining, f.	1,510
Norwood.—73 and 75, Harrington-rd., u.t. 51½ yrs., g.r. 16*l.* 10s., r. 75*l.*	335
February 20.—By A. THOMAS, PEVER, & MILES.	
Prince's Risborough, Bucks.—"The Lion Brewery," with eighty hotels, public and beer houses attached, f.	59,500
Fulham.—Aintree-st., the Eagle Brewery, f., r. 60*l.*	1,600
By MATTHEW MILES.	
City of London.—Milton-st., "The Grapes" p.-h., f., r. 150*l.*	4,975
By SIM & RANDALL.	
Stratford.—14 and 16, Reginald-rd., u.t. 82 yrs., g.r. 10*l.* 10s.	310
19 and 21, Ward-rd.. u.t. 58¾ yrs., g.r. 6*l.*	340
Holloway.—131, Corbyn-st., u.t. 71½ yrs., g.r. 6*l.*, r. 30*l.*	280
By WILLIAM HOUGHTON.	
Richmond.—62, 64, 65, 66, 67, 69, 71, 72, and 73, Houblon-rd., u.t. 58 yrs., g.r. 26*l.* 5s.	1,970
Clapton.—1 and 3, Detmold-rd., u.t. 80 yrs., g.r. 10*l.*	380

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c. Supplied by	Tenders to be delivered.
Chapel, Barwick-in-Elmet, Yorks....	.....	G. F. Danby, Archt. 10 Park-row, Leeds	Mar. 7
Culvert, Hounkley-road.....	Wrexham R.D.C.	J. Strachan, Surv Crispin Lodge, Wrexham... ...	do.
Shop and House, Alnwick.....	Graham & Henderson	R R Temperley, Alnwick Castle, Alnwick	do.
Schools, Graigellachie, N.B.....	Aberlour Sch. Bd.....	Brown & Watt, Archt. Aberdeen	do.
Alterations to Bryn Rhydderch House, near Penpergwm	.....	R. Williams, Archt. Pontypool	do.
Road Works	Bicester R.D.C.	G. Walsh, Council Offices..	do.
*Articles and Works	Tottenham U.D.C.....	Offices, 712, High-road, Tottenham.....	do.
Alterations to Shops, Market-street, Bradford.....	.....	Milnes & France, Archts. Bradford	Mar. 8
Mortuary, Tividale	Rowley Regis U.D.C..	D. Wright, Lawrence-lane, Old Hill, Rowley.....	do.
Road Stone and Kerbing	do.	do.	do.
Three Blocks Dwellings, Cowgate	Edinburgh Corp.	T. Hunter, City-chmbrs. Edinburgh	do.
Cottage, Blundeston, Lowestoft.....	.....	S. Rivett, Archt. 5 South Quay, Gt. Yarmouth	do.
Surveyor's Materials	Rishton U.D.C.	J. J. Adams, High-street, Rishton	do.
Park Shelter, &c. Beeston	....	City Engr. Municipal-bldgs. Leeds	do.
Street Works, Hawthorn-avenue	Hull Estates Co. Ltd.	Gelder & Kitchen, 74, Lowgate, Hull	do
Brick Bridge	Coventry Corp.	J. E. Swindlehurst, Engr. St. Mary's Hall, Coventry	Mar. 9
Eight Houses, Low Moor	Clockheaton Indus Co-op. Soc.	Secretary, Central Offices, Clockheaton	do.
Granite and Slag	Stafford R.D.C.	W. Morgan, 4, Martin-st. Stafford	do.
School Chapel, Idle Moor	.....	Walker & Cobbinson, Archt. Swan-arcade, Bradford ..	do.
Road Works	Bradfield R.D.C.....	J. Forrester, Surv. Theale, near Reading.....	do.
Sewerage Works, Isle of Arran, N.B.	Trustees of Duke of Hamilton	Warren & Stewart, Engr. 115, Wellington-st. Glasgow..	Mar. 10
Two Cottages, Broughton Moor, Maryport	....	B. Eilbeck, Standing Stones, Broughton Moor	do.
Granite.....	Billesdon(Leics.)R.D.C.	W. E. Richardson, 18, New-street, Leicester	Mar. 11
Surveyor's Materials	Padiham (Lancs.) U.D.C.	J. Gregson, C.E. Council Offices	do.
Slag and Granite	Norman Cross R.D.C.	Mr. Skinner, Surv. Norman Cross, Peterborough	do.
Reservoir	Rosemmon Waterworks Co.	C. Mulvany, C.E. Athlone	do.
Bridges, Millbeck, &c...	Carlisle R.D.C.	J. Bell, Road Surv. 1, Aglionby-st. Carlisle ..	do.
Roadway	Gosforth U.D.C.....	C. J. Bell, Surv. Council-chambers	do.
Reading Room, Carlton-road	Nottingham Corp.....	W. S. Starr, Archt. 12, St. Peter's-gate, Nottingham	Mar 13
Six Houses, Oakworth, Yorks	.....	Judson & Moore, Archts. Oakworth, nr. Keighley	do.
Additions to Hospital, Newton Heath	Manchester Corp.	City Surv Town Hall ..	do.
Slaughter House	Llandudno U.D.C. ..	E. P. Stephenson, Engr Church Walks, Llandudno	do.
Road Materials	Rotherham R.D.C ...	Mr. Bradbury, 29, High-st Rotherham	do.
Reservoir, Glantlees, Newton-on-the-Moor	Major Wildrington ..	M. T. Wilson, Archt. Alnwick	do.
Coal Stores	Cowes (I. of W.) U.D.C.	J. W. Webster, Engr. Council Offices	do.
Two Houses, Windmill-road, Cork ..	D. O'Reilly	W. H. Hill & Son, Archt. 28, South-mall, Cork ..	do.
Promenade Extension	Llandudno U.D.C.....	E. P. Stephenson, Engr. Church Walks, Llandudno	do.
*Asphalte Pavements	St. Giles Dist. B. of W.	G. Wallace, 197, High Holborn, W.C.	Mar. 14
*Sewer Work	do.	do.	do.
*Works and Materials (various)	do.	do.	do.
Road Materials	Littleborough (Lancs.) U.D.C.	G. A. Wild, Surv. Harehill-rd. Littleborough.... ...	do.
Bridge Widening, King's Lynn	.....	H. J. Weaver, C.E. Guildhall, King's Lynn	do.
*Road Making and Paving	Willesden D.C.	O. C Robson, Public Offices, Dyne-road, Kilburn	do.
*Fencing, Gates, &c.	Cty. Boro. of West Ham	Lewis Angell, Town Hall, Stratford..	do.
*Alterations, &c. Sewer Pumping Station, Pimlico	L.C.C.....	Engr's. Dept. Spring-gardens, S.W.	do.
*Materials (various)	Greenwich B. of W. ..	141, Greenwich-road, S.E.	Mar. 15
*Alterations to Workhouse Buildings	Camberwell Guardians	H. Jarvis & Son, 29, Trinity-square, Borough, S.E	do.
Cast-iron Pipe Laying (7 miles)	Weymouth Waterworks Co.	T. & C. Hawksley, C.E. 30, Great George-st. S.W. ..	do.
Drops and Granite, nr. Doncaster	Thorne R.D.C.....	G. Kenyon, Plantation-rd. Thorne.....	do.
Sewerage Works	Westbury - on - Trym R.D.C.	A. P. J. Cotterell, C.E. 7, Baldwin-st. Bristol	do.
Thirteen Houses	North Dublin Union	J. O. Neill, Union Offices, North Brunswick-street, Dublin.....	do.

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Forms of Tender, &c. Supplied by	Tenders to be delivered
Granite (1,000 tons)	Chelmsford T.C.....	G. H. Sage, Boro. Surv. 16, London-road, Chelmsford	Mar. 13
Surveyor's Materials	Hoo (Kent) R.D.C.	F. C. Thurston, Surv. Hoo	do.
*Timber and Concrete Wharf.....	Blackheath and Greenwich District Electric Light Co....	R. P. Wilson, 66, Victoria-st. S.W.	Mar. 16
*Hot-water Arrangements and Kitchen Fittings	Islington Guardians ..	W. Smith, 65, Chancery-lane, W.C.	do.
Dwellings, Lunishowen, co. Donegal..	Commrs. of Irish Lights	O. Armstrong, Sec. Irish Lights Office, Dublin..	do
Paving Works.....	Preston (Lancs.) Corp.	Boro. Surv. Town Hall	Mar. 17
Road Materials	Hoylake (Cheshire) U.D.C.	T. Foster, Surv. Council Offices	Mar. 18
Factory, Thornton-rd. Morecambe ..	Anderson & Sons.....	A. L. Lang, Archt. 12a, Pedder-st. Morecambe	Mar. 20
*Road Making	Beckenham U.D.C. ..	J. A. Augell, Council Offices	do.
*Heating of Swimming Baths, &c....	do.	do.	do.
*Deal and Jarrah Wood Blocks.....	Paddington Vestry ..	Surv Vestry Hall, Harrow-road, W.	do.
*Ballast, Sand and Cement.....	do.	do.	do.
*Pitch and Tar.....	do.	do	do.
*Workshop at the Workhouse	Croydon Union	F. West, 23, Coombe-road, Croydon	do.
*Well and Boring	Rochford Union	J. Mansergh, 5 Victoria-st. S.W.	do.
*Church, Hanley.....	.....	R. Scrivener & Sons, Archt. Hanley	Mar. 21
*School Buildings	.....	I. R. Brown & Son, 17 Market Hill, Luton	do.
Bridgework, Ringstead	Thrapston R.D.C.	G. Bunnybun, Council Offices	Mar. 24
York Paving Flags	Ramsgate Corp.	T. G. Taylor, Boro. Surv. Broad-st Ramsgate	Mar.
*Granite, Granite Chippings and Dust	Middlesex C.C.	H. T. Weklam, Guildhall, Westminster, S.W.....	April 4
*Cartage of Granite and Gravel.....	do.	do.	do
Bridge, near Lanchester.....	.....	W. H. Ritson, Lanchester, co. Durham	April 5
Additions to Premises, Adam-st, Cardiff.....	W. J. Rogers, Ltd.....	Jones, Richards & Co. Archts. 18 St. Mary-st. Cardiff.....	No date
Factory, Wrexham	Allcock & Co. Ltd.....	W. Slater, Archt. 9, High-st. Wrexham.....	do.
House, Bawstorn-rd. Colchester.....	A. G. Rayner	C. E Butcher, Archt. 3 Queen-st. Colchester	do.
Fourteen Cottages, Ashton-under-Lyne.....	.....	T. George & Son, Archt. Old-square, Ashton.....	do.
Villa, Torrisholme, nr. Morecambe ..	Wood Bros.	Marshall Bros. Archt. Back-crescent Morecambe	do.
Residence, Frinton-on-Sea	.....	B. Pite, Archt. 48, Harley-st. W.	do.
Shops and Houses, Kidderminster....	.....	J. M. Getting, Archt Kidderminster	do.
Two Villas, Finisklin, Sligo..... ...	A. Lyons	W. F. Gilcriest, C E. Wine-st. Sligo	do.
House and Shop, Sefton-rd. Morecambe	Mr. Stutton	Marshall Bros. Archt. Back-crescent. Morecambe	do.
Two Houses, Rossendale-avenue, Morecambe	.....	do.	do.
Houses and Shops, Catergate, Newark	Messrs. Atter	Sheppard & Harrison, Archt, 17, Kirkgate, Newark	do
Two Houses and Shop, James-st Llanelly	.....	W. Lewis, 19, Cadstream-st. Llanelly	do.
Laundry, South Acton	.....	G. P. Pratt, Arcnt. 10, The Parade, Acton.....	do.
Shop, Market-st. Lurgan, Ireland	J. Mullan	W. J. Moore, Arcnt Annst. Belfast	do.
Business Premises, Lurgan	P. Doyle	do.	do.
House, Pontefract-lane, Leeds.....	.....	F. Mitchell, archt. 9, Upper Fountaine-st. Leeds	do.
Church, Cardiff.....	.....	F. R. Kempson. Archt. 16, High-st. Cardiff	do.
*Dwelling House and Out-buildings ..	T. J. Edney	R. Isterry Wallis, Basingstoke	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in.
*Clerk of Works	Cty. Boro. West Ham	4l. 4s. per week	Mar. 4
*Clerk of Works	Festiniog County Sch.	.....	do.
*Manual Training Instructors and Assistant Woodwork Instructors..	Sch. Bd. for London..	Instructor's Min. 100l. per annum, Max 155.; Assistant's Min. 80l. Max. 100l.	Mar. 11 Mar. 18
*Outdoor Foreman.....	Longton Corp.....	2l. 10s. per week	

Those marked with an asterisk (*) are advertised in this Number. *Competitions, p.* iv. *Contracts, pp.* iv. vi. viii. x. & xxiii. *Public Appointments, pp.* xxi. & x

Walthamstow.—Addison-rd., Springfield and Hillside, f., r. 58*l*. £960
20, Summit-rd., f. 360
Church End, freehold stabling premises..... 800

By THOMAS NEALE (at Nottingham).

Nottingham.—31, Mayfield Grove, f..... 375
19, 21, and 23, Finch-st., and five houses in rear, f. 965

February 21.—By BROWETT & TAYLOR.

Stratford.—Tenby rd., f.g.r. 170*l*., reversion in 79½ yrs. 4,125
Strand.—3, Bedfordbury, u.t. 75½ yrs., g.r. 47*l*., r. 203*l*. 975
Manor-pk.—4 and 6, Rabbit's-rd., u.t. 995 yrs., g.r. 9*l*. 15s. 325

By DAVID BURNETT & CO.

Leyton.—35 to 47 (odd), Beaumont-rd., u.t. 79 yrs., g.r. 15*l*. 1,020
Walthamstow.—62 and 64, Hoe-st., u.t. 80 yrs., g.r. 7*l*. 350
Sutton, Surrey.—Clapham Lodge and 6 a., u.t. 64½ yrs., g.r. 30*l*. 700

By HARMAN BROS.

City of London.—63, Aldersgate-st., u.t. 60 yrs., g.r. 120*l*., r. 315*l*. 2,760
Hampstead.—1 to 13, Mansfield-pl., u.t. 60 yrs., g.r. 28*l*. 2,700
Finsbury Park.—18, Gloucester-rd., u.t. 80 yrs., g.r. 10*l*. 10s., r. 65*l*. 760

By W. R. NICHOLAS & CO.

Hare Hatch, Berks.—The Hawthorns and 3 a. 1 r. 32 p., f. 2,300

By G. F. HARRINGTON.

Edmonton.—Hertford-rd. (near), The Cock Field Building estate, 12 a., f. 4,300

Camberwell.—11 to 21 (odd), Hinton-rd., u.t. 68 and 66 yrs., g.r. 34*l*., r. 218*l*. £1,615

By C. & H. WHITE.

Walworth.—Lorrimore-st., &c., i.g.r. 200*l*., u.t. 55 yrs., g.r. 70*l*. 12s. 2,520
Battersea.—286, 292, and 294, Battersea Park-rd., u.t. 78½ yrs., g.r. 32*l*. 10s., r. 215*l*. 3,110
Wandsworth.—9, Dent's-rd., u.t. 81½ yrs., g.r. 7*l*. 16s., r. 38*l*. 435
Brixton.—26, 28, and 30, Crasters-rd., u.t. 77 yrs., g.r. 21*l*., r. 100*l*. 930
Camberwell.—31, 33, and 35, Grace's-rd., u.t. 60 yrs., g.r. 16*l*. 10s., r. 90*l*. 930
Plaistow.—40 to 48 (even), Garfield-rd., u.t. 82½ yrs., g.r. 17*l*. 10s. 380

By DEBENHAM, TEWSON, & CO.

Crouch End.—Crouch Hill, f.g.r. 60*l*., reversion in 69½ yrs. 1,940
Cecile Pk., f.g.r.'s 247*l*. 10s., reversion in 83 yrs. 7,950
Cecile Pk., f.g.r. 45*l*. 4s., reversion in 89 yrs. .. 1,450
Cecile Pk., f.g.r.'s 190*l*., reversion in 83 yrs..... 6,040
Bank-bldgs., f.g.r. 92*l*., reversion in 86 yrs. 2,950
Weston-pk., f.g.r. 42*l*., reversion in 87 yrs. 1,320
Weston-pk. f.g. rents 259*l*., reversion in 83 yrs. 8,190
Weston-pk., f.g.r. 27*l*., reversion in 89½ yrs..... 840
Weston-pk., f.g. rents 306*l*. 7s., reversion in 83 yrs. 9,710
Elder-av., f.g. rents 193*l*. 3s., reversions in 83 and 89 yrs. 6,110
Fairfield-rd., f.g. rents 75*l*. 17s., reversions in 87 and 89 yrs. 2,390
Fairfield-rd., f.g. rents 174*l*. 11s., reversion in 89 yrs. 5,530
Aubrey-rd., f.g. rents 106*l*. 5s., reversion in 89 yrs. 3,330
Palace-rd., f.g.r. 11*l*., reversion in 79 yrs. 330
Middle-lane, f.g. rents 111*l*. 6s., reversion in 65 and 60 yrs £3,310
Palace-rd., f.g.r. 14*l*. 14s., reversion in 60 and 79 yrs. 440
Barrington-rd., f.g.r. 11*l*., reversion in 79 yrs... 330
Holloway.—Aubert-pk., f.g.r. 41*l*. 16s., reversion in 77½ yrs. 1,250
Brixton.—Josephine-av., f.g. rents 58*l*. 10s., reversion in 91 yrs. 1,760
Arodene-rd., &c., f.g. rents 307*l*., reversion in 91 yrs. 9,210
Helix-rd., &c., f.g. rents, 364*l*. 10s., reversion in 91 yrs. 10,920
Leander-rd., f.g.r. 42*l*., reversion in 91 yrs. 1,250
Brixton Hill, f.g. rents., 150*l*., reversion in 66½ yrs. 4,570

By BOYTON, PEGRAM, & BUCKMASTER (at Walham Green).

Fulham.—17, Fristen-st., u.t. 93 yrs., g.r. 6*l*. 10s., r. 35*l*. 365
Lillie-rd., a freehold building plot 405
40, Purser's Cross-rd., u.t. 89 yrs., g.r. 5*l*. 375

February 22.—By BEARD & SON.

Notting Hill.—5, Victoria-gardens, u.t. 60 yrs., g.r. 4*l*. 5s., e.r. 45*l*. 545
15 and 35, Dartmoor-st., u.t. 50¼ yrs., g.r. 10*l*... 770
Kilburn.—3, Goldsmith-gardens, u.t. 45½ yrs., g.r. 5*l*., r. 23*l*. 195

By HIGGINS & SON.

Hampstead.—21, 23, 26, and 28, King's College-rd., u.t. 53¼ yrs., g.r. 32*l*., r. 310*l*. 3,155
9 and 9A, King's College Mews East, u.t. 53½ yrs., g.r. nil 470
9, 9A, and 10, King's College Mews West, u.t. 53½ yrs., g.r. nil 530

St. John's Wood.—59 and 61, Springfield-rd., u.t. 38 yrs., g.r. 16*l.* 16s., r. 130*l.* £1,225
19 and 20, Queen's-ter., u.t. 21 yrs., g.r. 25*l.*, r. 175*l.* 980
Paddington.—7, Praed-st., u.t. 13½ yrs., g.r. 5*l.*, r. 85*l.* 550

By H. DONALDSON & SON.

Bermondsey.—63, 64, 65, and 66, Grange Walk, area 6,300 ft., f. 1,575
Stoke Newington.—39, 41, 43, and 45, Cowper-rd., f., r. 132*l.* 14s. 1,875
7, Goldsmith-sq., u.t. 53 yrs., g.r. 2*l.* 285

By ERNEST OWERS.

Cricklewood.—34 and 36, Oaklands-rd., u.t. 93 yrs., g.r. 12*l.*, r. 68*l.* 680
Shepherd's Bush.—1, The Market, u.t. 97 yrs., g.r. 18*l.*, r. 105*l.* 1,500
Wimbledon.—Alexandra-rd., f.g.r. 39*l.*, reversion in 90½ yrs. 1,090

By E. W. RICHARDSON & SON.

Hackney.—Hackney-rd., f.g.r. 12*l.*, reversion in 12 yrs. 450
Hackney-rd., f.g.r. 12*l.*, reversion in 35 yrs. 350
Holloway.—58, Langdon-rd., u.t. 79 yrs., g.r. 5*l.* 10s. 140
Tottenham.—Wakefield-rd., Fern Villa, u.t. 79 yrs., g.r. 8*l.*, r. 28*l.* 270

By G. PEARCE & SONS.

Stoke Newington.—10, Springdale-rd., u.t. 68 yrs., g.r. 5*l.*, r. 40*l.* 380
34, 36, and 38, Springdale-rd., u.t. 72½ yrs., g.r. 16*l.* 910
42 and 44, Springdale-rd., u.t. 68 yrs., g.r. 13*l.* 13s., r. 80*l.* 700
47, Springdale-rd., u.t. 72½ yrs., g.r. 5*l.* 5s. 270
95, Aden-grove, u.t. 72½ yrs., g.r., 5*l.* 320
21, Wolsey-rd., u.t. 51 yrs., g.r. 5*l.* 10s., r. 30*l.* 310
Islington.—73, Southgate-rd., u.t. 17 yrs., g.r. 5*l.* 5s., r. 40*l.* 250
De Beauvoir Town.—54 and 56, Ufton-rd., u.t. 21½ yrs., g.r. 6*l.*, r. 68*l.* 420
Hoxton.—21 to 24, Baring-st., u.t. 33¾ yrs., g.r. 20*l.* 840
1, Gopsall-st., u.t. 33 yrs g.r. 4*l.* 4s 260
123 and 125, New North-rd., u.t. 19½ yrs., g.r. 42*l.*, r. 90*l.* 290
112, 114, and 116, Wenlock-st., u.t. 43¾ yrs., g.r. 12*l.* 12s., r. 111*l.* 1,020
13, 17, 21, 23, and 25, St. John's-rd., u.t. 23 yrs., g.r. 93*l.* 8s., r. 158*l.* 400
27, St. John's-rd., u.t. 23 yrs., g.r. 10*5l.*, r. 171*l.* 16s. 165
Hackney.—28 to 32, West Side, u.t. 48¾ yrs., g.r. 30*l.* 1,170
Homerton.—44, Church-rd., u.t. 55 yrs., g.r. 3*l.* 3s., r. 32*l.* 270
Canonbury.—24, Canonbury-sq., u.t. 19½ yrs., g.r. 23*l.*, r. 45*l.* 110
Commercial-rd. East.—102, Watney-st., f., r. 63*l.* 1,110
Belvedere, Kent.—Abbey-rd., i.g.r. 22*l.* 5s., u.t. 61½ yrs., g.r. 10*l.* 10s. 210

By R. TIDEY & SON.

Hackney.—22 to 28 (even), 32, 34, 36, and 42, Amhurst-rd., f., r. 400*l.* 6,400
Islington.—2, Ockenden-rd., u.t. 42 yrs., g.r. 6*l.* 10s., e.r. 48*l.* 550
Holloway.—33, Milton-gr., u.t. 75 yrs., g.r. 10*l.*, r. 40*l.* 325
Highbury.—26 to 32 (even), St. Paul's-rd., u.t. 26¾ yrs., g.r. 40*l.* 1,035
80, St. Paul's-rd., u.t. 26¼ yrs., g.r. 8*l.* 12s., r. 43*l.* 255
Canonbury.—2, St. Paul's-pl., u.t. 26¾ yrs., g.r. 10*l.*, r. 41*l.* 235
Kingsland.—299, Kingsland-rd., u.t. 20 yrs., g.r. 12*l.* 10s., r. 40*l.* 200
307 and 309, Kingsland-rd., u.t. 18 yrs., g.r. 1*l.*, r. 70*l.* 450

By DOUGLAS YOUNG & CO.

Forest Gate.—38 and 42, Vansittart-rd., u.t. 88 yrs., g.r. 10*l.* 275
New Cross.—30, Casella-rd., u.t. 58 yrs., g.r. 5*l.*, r. 34*l.* 345
Streatham.—35, Hopton-rd., u.t. 81 yrs., g.r. 9*l.*, r. 50*l.* 430
Oakdale-rd., five plots of building land, f. 900
Clapham.—81, Sandmere-rd., u.t. 82 yrs., g.r. 7*l.*, r. 36*l.* 375

By CHADWICK & SONS (at Maida Vale).

Maida Vale.—No. 88, Lease for 11 yrs., r. 85*l.* .. 100
Paddington.—13, Walterton-rd., u.t. 64¾ yrs., g.r. 9*l.*, r. 45*l.* 410

By RIDER & SONS (at Shepherd's Bush).

Shepherd's Bush, 19, 21, and 23, Sterne-st., f., r. 101*l.* 8s. 1,250
11 and 14, Tadmor-street, f., r. 71*l.* 10s. 905
26, Caxton-rd., f., r. 35*l.* 8s. 410

By WILLIAM WESTON (at Harrow-rd).

Harlesden.—6, 8, 10, 12, 35, 37, 39, and 41, Tubb's-rd., u.t. 83 yrs., g.r. 44*l.*, r. 250*l.* 2,495
Kensal Town.—264 and 266, Kensal-rd., and Great Western House in rear, u.t. 75¼ yrs., g.r. 10*l.*, r. 120*l.* 16s. 620

By THOMAS MARTIN (at Exeter).

Exeter, Devon.—243 and 244, High-st., area 5,000 ft., f. 7,000

By RICHARD PETER (at Launceston).

Broadwoodwidger, Devon.—Kellacott Farm, 35a. 1r. 26p., f. 1,105
Higher Grinnacombe Farm and Grinnacombe Wood, 118 a. 0 r. 22 p., f. 1,120

February 23.—By ALDER & CO.

Upton Pk.—82, 84, 86, and 88, Tudor-rd., u.t. 88 yrs., g.r. 20*l.* 750

By MARK LIELL & SON.

Manor Pk.—Romford-rd., three plots of building land, f. 645
Romford-rd., a freehold building site 620
Forest Gate.—34, Neville-rd., f., e.r. 26*l.* 255
Poplar.—173 and 175, Upper Chrisp-st., u.t. 64 yrs., g.r. 5*l.* 500

By CHESTERTON & SONS.

Fulham.—600 and 602, Fulham-rd., f., r. 175*l.* 3,620

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; for yard, &c.

PRICES CURRENT OF MATERIALS.

TIMBER.		
Greenheart, B.G. ton	8/0/0	0/0/0
Teak, E.I....load	10/10/0	15/10/0
Sequoia, U.S.ft.cu.	1/9/0	2/0/0
Ash, Canada, load	3/17/6	5/5/0
Birch, do.	3/0/0	5/0/0
Elm, do.	4/12/6	5/15/0
Fir, Dantsic, &c..	2/0/0	4/0/0
Oak, do.	3/5/0	3/15/0
Canada	4/0/0	6/0/0
Pine, Canada red.	0/0/0	0/0/0
Do. yellow	4/7/6	6/5/0
Lath, Dantsic, fath	4/10/0	5/10/0
St. Petersburg..	4/0/0	6/10/0
Wainscot, Riga, &c., log	3/15/0	5/15/0
Odessa, crown....	3/15/0	5/15/0
Deals, Finland 2nd & 1st std. 100 ..	9/15/0	10/5/0
Do. 4th & 3rd..	9/15/0	10/5/0
Do. Riga	8/5/0	9/5/0
St. Petersburg, 1st yellow	11/15/0	14/5/0
Do. 2nd yellow.	10/15/0	12/5/0
Do. white.....	9/15/0	11/15/0
Swedish.....	9/15/0	16/15/0
White Sea	10/15/0	18/0/0
Canada, Pine 1st	18/15/0	25/5/0
Do. do. 2nd ..	13/15/0	17/0/0
Do. do. 3rd, &c.	6/0/0	10/0/0
Do. Spruce, 1st.	8/10/0	10/10/0
Do. do. 3rd and 2nd	7/5/0	8/10/0
New Brunswick	7/5/0	8/0/0
Battens all kinds .	5/0/0	16/0/0
Flooring boards, sq., 1 in., prep. 1st	9/6	16/3
Do. 2nd.....	8/0	13/3
Other qualities—	6/3	7/0
Cedar, Cuba, ft...	/4	/4½
Honduras, &c..	/3¾	/4½
Mahogany, Cuba.	/5½	/7
St. Domingo, cargo av.	/5	1/3
Mexican, do. do.	/3¾	/4
Tobasco, do. do.	/4	/6½
Honduras, do...	/4	/6
Box, Turkey, ton.	4/0/0	15/0/0
Rose, Rio.....	7/0/0	14/0/0
Bahia	6/0/0	12/0/0
Satin, St. Doming.	/5	1/0

TIMBER *(continued)*.		
Satin, Porto Rico	0/0/9	0/2/0
Walnut, Italian ..	0/0/3	0/0/7
METALS.		
Iron—Pig, in Scotland .....ton	2/13/11	0/0/0
Bar, Welsh, in London.....	6/0/0	6/5/0
Do. do. at works in Wales	5/15/0	5/17/6
Do. Staffordshire, in London	6/5/0	7/10/0
COPPER—British cake and ingot	76/0/0	76/10/0
Best selected ..	77/0/0	77/15/0
Sheets, strong..	79/0/0	81/0/0
Chili bars	71/10/0	0/0/0
YELLOW MTL. lb.	7d.	7½d.
LEAD—Pig		
Spanish ....ton	14/10/0	0/0/0
English com. Brands	14/15/0	0/0/0
Sheet, English 6 lbs. per sq. ft. and upwards ..	15/15/0	0/0/0
Pipe	16/5/0	0/0/0
ZINC—English sheet.....ton	30/0/0	0/0/0
Vieille Montagne	31/0/0	0/0/0
Spelter	27/15/0	27/17/6
TIN—Straits	107/0/0	0/0/0
Australian.....ton	107/0/0	107/10/0
English Ingots .	110/0/0	111/0/0
Banca.....	0/0/0	0/0/0
Billiton	0/0/0	0/0/0
OILS.		
Linseed .....ton	17/7/6	0/0/0
Cocoanut, Cochin	27/15/0	0/0/0
Do. Ceylon	24/10/0	0/0/0
Palm, Lagos.....	21/15/0	0/0/0
Rapeseed, English pale	22/15/0	0/0/0
Do. Brown	21/5/0	0/0/0
Cottonseed ref. ..	15/0/0	16/0/0
Oleine.....	17/0/0	18/0/0
Lubricating U.S.	0/5/3	0/7/6
Do. Black.....	0/5/0	0/6/6
TAR—Stockholm barrel	1/5/0	0/0/0
Archangel.....	0/18/0	0/0/0
Turpentine	32/5/0	32/7/6

TO CORRESPONDENTS.

F. W. R. (Below our limit). J. C.—C. E. (Amounts should have been stated).

NOTE.—The responsibility of signed articles, letters, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article is given subject to the approval of the article, when written, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays*. N.B.—We cannot publish Tenders unless authenticated by the name and address of the sender; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under £100, unless in some exceptional cases and for special reasons.]

BOURNEMOUTH.—For the erection of schools, Pokesdown, for British Schools Committee. Mr. Corbin Harris, J.P., Architect, Glendale, Pokesdown, Bournemouth:—

Jenkins & Sons	£2,337 0	Meadus	£1,940 0
S. Whittaker	2,019 13	F. Elcock, Pokesdown*	1,490 0

* Accepted.

BRENTFORD.—For the erection of a vestry hall, Half Acre, for the Overseers, Old Brentford. Mr. Nowell Parr, architect:—

F. & H. F. Higgs	£8,196	Young	£7,027
Brooking	7,887	T. Nye	6,997
Godson & Sons	7,562	J. Dorey & Co., Brentford*	6,861
Foord & Sons	7,185		

* Accepted.
Architect's estimate, £7,041.

CASTLETHORPE (Bucks).—For additions, &c., to schools, for the School Board. Mr. H. H. Dyer, architect, 1, Sheep-street, Northampton:—

Bransom & Sons	£215 8	E. Webster	£177 0
Wilson P. Alright	200 15	J. Sharman	175 0
Tanner Bros.	195 0	J. M. Panting	170 0
W. Heap	188 0		

CIRENCESTER.—For the construction of a surface-water drain, for the Urban District Council. Mr. Thomas Hibbert, surveyor, Cirencester. Quantities by surveyor:—

Hipwell & Co.	£4,590 0 0	J. & T. Binns	£3,561 15 3
Ambrose	3,931 4 10	Saunders & Sons, Ltd.	3,537 11 6
William Webb	3,896 0 0	Drew Brothers, Cirencester*	3,421 18 2
H. Welldon	3,749 5 0		
Thomas Free & Sons	3,623 16 6		

* Accepted.

ROSSHAVEN (Ireland).—For the reconstruction of a house into dispensary premises, for the Kinsale Union Guardians. Mr. R. Evans, C.E., 53, South-mall, Cork:—

T. B. Buckley, Crosshaven, co. Cork £155

HERTFORD.—For pulling down and rebuilding "The Turk's Head," Railway-street. Mr. Percival C. Blow, architect, 7, London-road, St. Albans:—

Miskin & Son	£1,285	R. Ginn & Son*	£1,019
Ekins & Co.	1,250		

* Accepted

ILFORD.—For erecting and completing shop premises, Cranbrook-road, Ilford Essex, for Mr. W. F. Prentis. Messrs. Verlyck & Dunn, architects:—

Bruty	£2,515	Willmott	£2,350
North	2,498	Pridmore	2,195
Mitchell	2,167	Gowen	1,950
Shepherd	2,381		

LEICESTER.—For the construction of sewers, &c., Coalville, for the Urban District Council. Mr. J. B. Everard, C.E., 6, Millstone-lane, Leicester:—

J. Biggs	£26,962 0 0	E. Orton	£20,756 0 0
J. Holme	26,220 0 0	E. Tempest	20,093 4 2
G. Bell	21,652 0 0	J. Ford	19,871 17 4
W. & J. Foster	21,546 9 4	Bentley & Loch, Leicester*	17,969 0 0
H. Weldon	21,326 19 7		
C. Walker & Co.	21,178 0 0		

* Accepted.
Engineer's estimate, £17,870.

LEICESTER.—For new warehouses for Mr. Winterton. Mr. Charles Kempson, architect, Corporation Buildings, Leicester Quantities by the architect:—

Marston & Son	£6,940	J. Pipes	£6,700
Major & Son	6,914	T. Herbert	6,689
J. Holmes	6,897	C. Wright	6,676
Hutchinson & Son	6,890	Bowles & Son	6,637
J. Chapman	6,813	Bradshaw Bros.	6,607
H. Bland	6'773	Riddett & Son	6,498
Johnson & Son	6,760	W. Tyrrell	6,364
Carr Bros.	6,761	A. Carr	6,281
Clark & Garrett	6,742	W. Jayes*	6,230
J. O. Jewsbury	6,738		

* Accepted.
[All of Leicester.]

LONDON.—For alterations to the "Cricketers," Stoke Newington, for Mann, Crossman, & Paulin, Limited. Mr. William Stewart, architect:—

Geo. Barker	£452	Crampton	£379
Finn	425	Lancaster	352

LONDON.—For new public baths and washhouses, Cheshire-street, for the Vestry of St. Matthew, Bethnal Green, E. Mr. R. Stephen Ayling, architect:—

Engineering Work.

Richmond & Co.	£6,698 0	Goddard, Massey, & Warner	£4,640 19
Bradford & Co.	5,546 0	Williamson & Co.	4,640 0
Fraser & Fraser	5,444 0	Armstrong & Co.	4,600 0
Ashwell & Nesbitt	5,177 0	J. & F. Clarke	4,575 0
Summerscales & Co.	4,878 0	Z. D. Berry & Sons	4,370 0
J. & F. May	4,874 0		
Mackintosh, Meikle, & Co.	4,664 0		

Additional for Galloway's Boiler and Marshall's Engine.

J. & F. Clarke	£55 0	Z. D. Berry & Sons	£173 10

Totals.

J. & F. Clarke	£4,630 0
Z. D. Berry & Sons (accepted)	4,543 10

LONDON.—For the erection of cottages at the Heathwall pumping station, for the London County Council:—

J. Appleby	£1,296 15 4	H. Wragg & Sons	£1,077 0 0
T. L. Green	1,193 14 3	W. Hammond	1,069 0 0
General Builders, Limited	1,180 0 0		

LONDON.—For the erection of fencing and gates at the Wells-road, Sydenham, recreatio ground, for the London County Council:—

L. Faulkner & Sons	£720 0 0	Hill & Smith	£533 17 6
McVey, Rennie, & Co.	576 19 0	E. J. Raybould & Co., Limited	525 0 0
W. Hayward & Sons, Limited	546 0 0		

LONDON.—For erecting a dwelling-house at View-road, Highgate, N. Mr. Michael Bunney, architect, 1, Langham Chambers, Langham-place, W.:—

Davenall	£2,420	Turner, Limited	£2,087
Hosking	2,199	Marchant & Hirst	2,045
Dixon	2,100		

LONDON.—For erecting stabling, covered yard, and caretaker's house in Vicarage-lane, Stratford, E., for Messrs. Boardman & Sons. Messrs. Yetts, Sturdy, & Usher, architects, 44, Finsbury-pavement, E.C.:—

Faulkner	£8,283	Woodward	£7,689
Hosking	8,059	Parmenter	7,639
Shurmer	7,950	Patman & Fotheringham	7,631
Patrick	7,837	Battley, Sons & Holness	7,547
Downes	7,810		

LONDON.—For alteration at the "Black Horse," Great College-street, N.W. Mr. H. Riches, architect, 13, Crooked-lane, King William-street, E.C.:—

Lacy	£249	Osborne & Sons	£219
Sheffield Bros.	229	Marchant & Hirst	189

LONDON.—For alterations at the "Royal Engineers," Westminster Bridge-road, for the New London Brewery Company, Limited. Mr. John Hamilton, architect:—

Whitehead & Co.	£339	Geo. Barker	£320
W. Smith	339	G. E. Maxwell	310

LONDON.—For additions to Freemasons' Hall, Great Queen-street, W.C. Mr. Henry L. Florence, architect, 3, Verulam-buildings, Gray's Inn. Quantities by Mr. James Francis Bull, 30, Bedford-row, W.C.:—

G. H. & A. Bywater & Sons	£13,200	Ashby & Horner	£12,578
Thos. Rider & Son	12,696	Colls & Sons	12,470
Geo. Trollope & Sons	12,735	W. Cubitt & Co.*	12,077

* Accepted.

LUTON.—For shop and stores, Chapel-street, for Mr. C. W. Deacon. Mr. A. Wilkinson, architect, Luton:—

G. Buckingham	£351	G. W. Pryer*	£289
G. Angel	320	D. Parkins	285
Saunders & Son	304		

* Accepted.
[All of Luton.]

NORTHALLERTON.—Accepted for the erection of a villa for Mr C. Alexander. Mr. W. Perkins, architect, Bishop Auckland. Quantities by architect:—

Masonry and Joinery.—D. Oakley, Bishop Auckland	£730 0
Slating.—J. Harrison, Middlesbrough	47 10
Plastering.—F G. Walsh, Bridlington	61 10
Plumbing and Glazing.—Sykes & Co., Darlington.	119 5
Painting.—T. Alderson, Northallerton	24 12

NORTHAMPTON.—For erecting three houses and shops in St. James-road, St. James-end, for Messrs. Carr & Harrison. Mr. H. H. Dyer, architect and surveyor, 1, Sheep-street, Northampton. Quantities by architect:—

C. Webster	£1,175 0	J. M. Panting	£1,100 0
W. Throssell	1,160 0	A. J. Chown	1,093 0
Wingrove & Stanley	1,159 0	E. D. Sharman & Son	1,090 0
F. Harper	1,154 10	Wilford & Judkin	1,089 0
G. T. Fisher	1,140 0	W. T. Flavell	1,080 0
Wilson & Alright	1,120 0	W. Higgins	1,075 0
W. Heap	1,120 0	J. Nobles & Son*	1,000 0
J. Dunckley	1,118 6		

* Accepted.
All of Northampton.

NORTHAMPTON.—For semi-detached villa, Duston, for Mr. T. C. Thompson (exclusive of grates and plumbers', painters', and glaziers' work). Mr. H. H. Dyer, architect and surveyor, 1, Sheep-street, Northampton:—

J. Garrett	£899 0 0	J. G. Pullen & Sons	£784 10 6
E. D. Sharman & Son	815 0 0	J. Nobles & Son	770 0 0
Wingrove & Stanley	813 0 0	W. Higgins	764 10 0
W. Heap	810 0 0	Crow & Gardner	760 0 0
Wilson & Alright	802 0 0	A. J. Chown*	760 0 0
C. Webster	799 0 0		

* Accepted.

Plumbers', Painters', and Glaziers' Work.

R. Cleaver (accepted) £135 6 0

PENDLETON (near Salford).—For the construction of retaining walls, &c., for the Salford Corporation. Mr. J. Holt, C.E., 6, St. Mary's-gate, Manchester:—

Wilson & Lunt	£10,984 11 5	Byrom	£6,393 10 6
Briggs	7,553 2 0	Tims	6,351 10 0
Dixon	7,385 0 0	Cottle	6,151 3 0
Braddock	6,851 13 5	Etheridge & Clarke	5,865 14 3
Bentley	6,821 5 0	Clewarth & Robinson	5,760 0 0
Healey	6,768 10 0	Tate & Gordon, Manchester*	5,357 19 5
Meadows	6,758 17 6		
Walmsley & Roberts	6,710 0 0		
Morton	6,510 4 4		

* Accepted.

REIGATE.—Accepted for erecting a house at Udderhill Park, Reigate, for Mr. R. C. Smith. Mr. C. E. Salmon, architect, Bell-street, Reigate:—

W. Bagaley & Sons £1,950

RIPLEY.—For erecting "Moss Cottage" Inn, Ripley, near Derby. Mr. R. Argile, architect. Quantities supplied:—

W. Norman	£1,179 0 0	Harris & Hunt, Marehay, near Derby*	£1,111 2 6
J. Warren	1,150 0 0		
W. Harris	1,117 0 0		

* Accepted.

ROCHFORD.—For the enlargement of, and additional wards to infirmary for the Rochford Board of Guardians, Rochford, Essex. Mr. E. Wright, architect, Southend:—

S. Norden	£7,050 0	J. W. Steward, Southend-on-Sea (accepted)	£6,998 10
Davey & Son	7,023 0		

Architect's estimate, £6,893.

RYDE.—For two additional class-rooms to the Upper Grade Boys School, for the Ryde School Board. Mr. John I. Barton, architect, Ryde:—

Whitewood	£820	Barton	£709
James	795	Holland, Ryde*	579
Wheeler Bros.	750		

* Accepted.

ST. ALBANS.—For the erection of Prestwood Cottage, Sandridge-road, for Mr. F. G. Merkins. Mr. Percival C. Blow, architect, 7, London-road, St. Albans:—

E. Dunham	£385	Goodchild*	£281
Bushell	299		

* Accepted.

ST. ALBANS.—For the erection of drying and bleaching works, Grange-street, for Messrs. E. & W. Hitchcock & Son. Mr. Percival C. Blow, architect, 7, London-road, St. Albans:—

Miskin & Son	£992	Bushell*	£965
Dunham	975		

* Accepted subject to slight alteration.

ST. ALBANS.—For repairs to St. John's Lodge, Verulam-road. Mr. Percival C. Blow, architect, 7, London-road, St. Albans:—

Miskin & Son	£254 0	Bushell*	£245 0
Brightman	248 10		

* Accepted.

SOUTHAMPTON.—For building licensed house and two private houses adjoining, Bellemoor Estate, Shirley, for Messrs. Wm. Cooper & Co., Limited. Mr. William Burrough Hill, architect, Southampton:—

Jenkins & Sons	£1,974	J. J. Udall & Co.	£1,877
Playfair & Toole	1,897	Henry Cawte*	1,772
H. Stevens & Co.	1,877		

* Accepted.

[All of Southampton].

SOUTHAMPTON.—Accepted for building twenty-nine houses in Ascupart-street and Wilton-street. Mr. William Burrough Hill, architect, Southampton:—

John Treherne £7,250

SOUTHAMPTON.—Accepted for rebuilding front and alterations and repairs to No. 85, Above Bar. Mr. William Burrough Hill, architect, Southampton:—

J. J. Udall & Co. £1,398

STOCKTON-ON-TEES.—For erecting new premises, for Messrs. D. Hill, Carter & Co., Limited, Stockton-on-Tees. Mr. Eugene E. Clerihan, architect, St. Nicholas Chambers, Newcastle-on-Tyne:—

Joseph Howe & Co.	£2,900 0 0	Craggs & Benson, 37, Hume-street, Stockton-on-Tees*	£2,420 0 0
John Davison	2,605 17 11		
Allison Bros.	2,600 0 0		
R. Blackett & Son	2,595 0 0	G. T. Manners	2,345 0 0
Perks & Son	2,434 0 0	A. Atkinson & Co.	2,222 11 9

* Accepted.

WALSALL.—For the erection of Board Offices, Pleck-road, for the Union Guardians. Mr. H. E. Lavender, architect and surveyor, Walsall:—

Hopkins	£3,906	Tildesley	£3,490
Hughes	3,620	W. Wistance*	3,497
Mallin	3,649	Hemming	3,392
Gough	3,590	Craddock	3,265
Insley	3,590	Hall	2,930
Guest & Sons	3,530		

* Accepted.

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WELLINGBOROUGH.—For the construction o sewage disposal works for the Rural District Council. Mr. J. B. Everard, C.E., 6, Millstone-lane, Leicester:—

H. Weldon	£1,598 17 6	J. C. Trueman	£929 0 0
Tanner Bros.	1,162 15 0	W. Smart	922 9 9
Johnson & Son	1,149 0 0	J. Ford	887 16 0
Main, Kendal, & Main	1,045 0 0	Wingrove & Stanley	876 11 7
H. Martin	1,019 0 0	Siddons & Freeman, Oundle*	870 0 0
T. & C. Berril	1,004 0 0		

* Accepted.

WILLASTON (Cheshire).—For the execution of sewerage works, for the Rural District Council. Mr. A Hughes, surveyor, 5, Birchroad, Bebington:—

P. Gavan	£606 0 0	C. J. Shaw & Co.	£577 5 0
R. Allen	585 0 0	J. Price	528 0 0
I. Merritt	583 6 6	A. Harris, Upton*	480 9 7
Roberts & Williams	580 0 0		

* Accepted; but the Council have decided since to elaborate the scheme.

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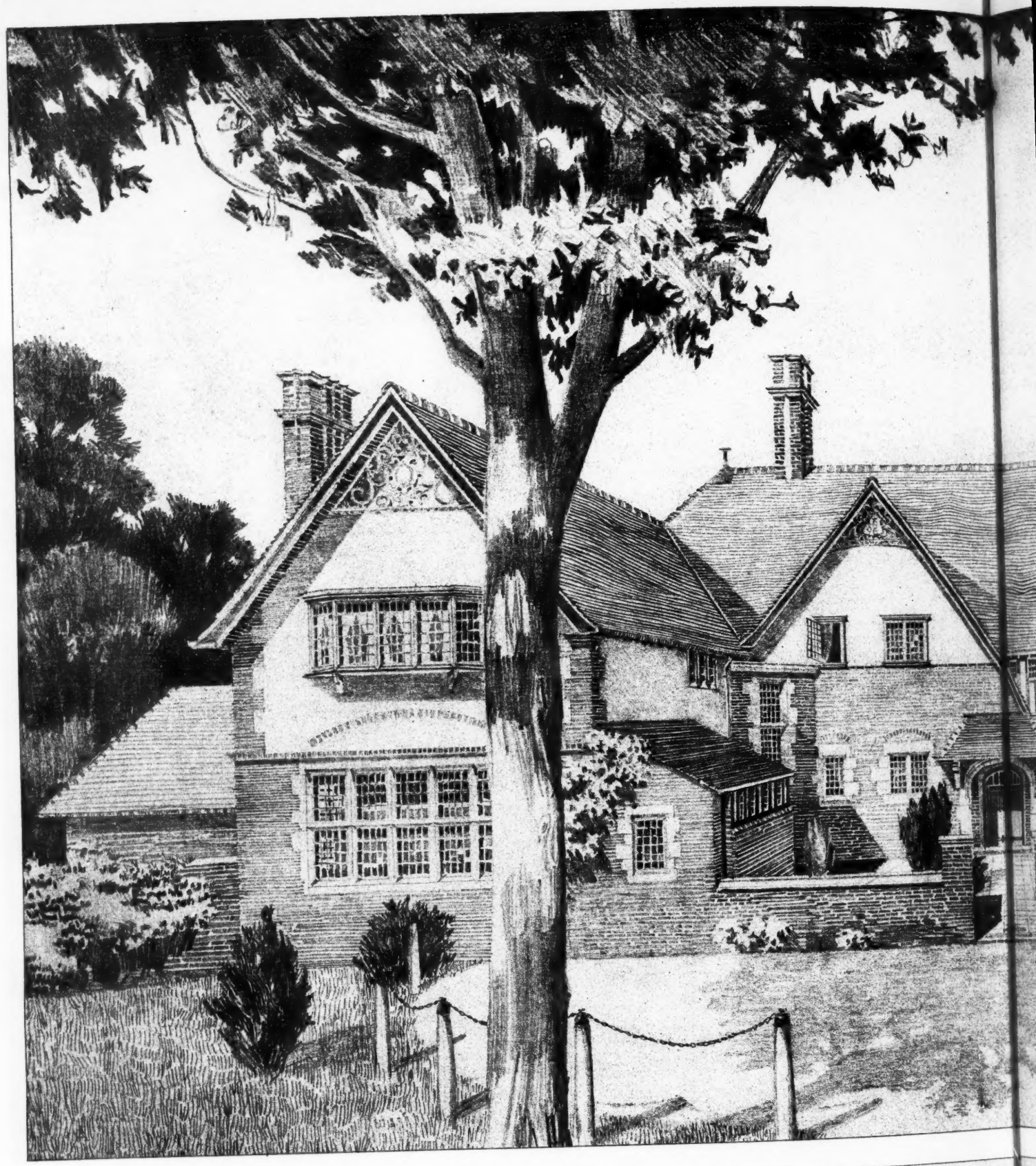

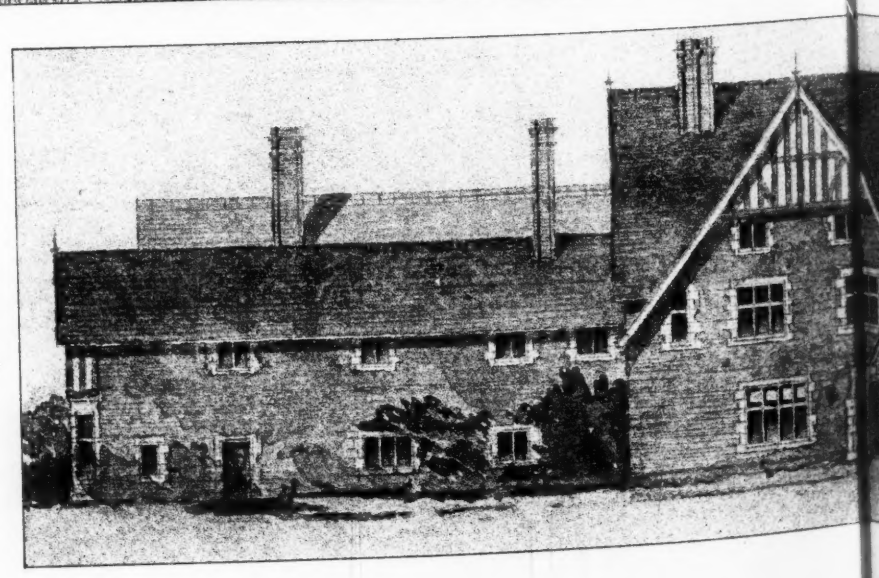

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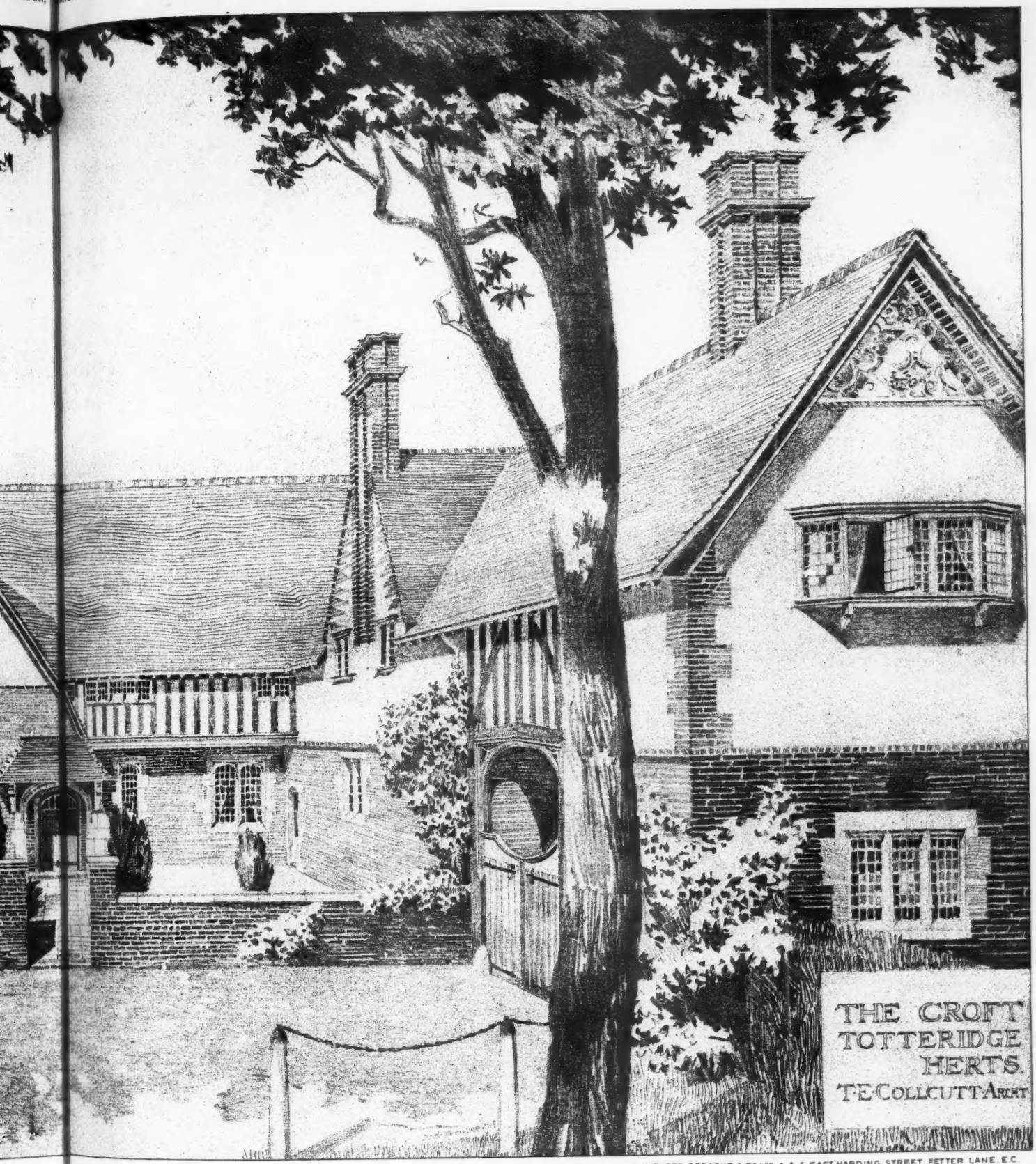

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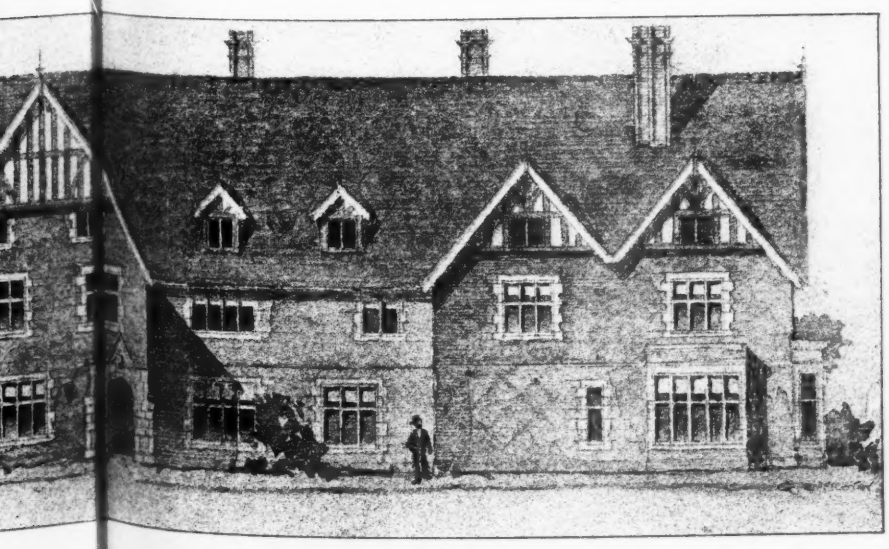

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